MONTHLY WEATHER REVIEW.

Editor: Prof. CLEVELAND ABBE.

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INTRODUCTION.

The MONTHLY WEATHER REVIEW for February, 1901, is based on reports from about 3,100 stations furnished by employees and voluntary observers, classified as follows: regular stations of the Weather Bureau, 159; West Indian service stations, 13; special river stations, 132; special rainfall stations, 48; voluntary observers of the Weather Bureau, 2,562; Army post hospital reports, 18; United States Life-Saving Service, 9; Southern Pacific Railway Company, 96; Canadian Meteorological Service, 32; Mexican Telegraph Service, 20; Mexican voluntary stations, 7; Mexican Telegraph Company, 3; Costa Rica Service, 7. International simultaneous observations are received from a few stations and used, together with trustworthy newspaper extracts and special reports.

Special acknowledgment is made of the hearty cooperation of Prof. R. F. Stupart, Director of the Meteorological Service of the Dominion of Canada; Mr. Curtis J. Lyons, Meteorologist to the Hawaiian Government Survey, Honolulu; Señor Manuel E. Pastrana, Director of the Central Meteorological and Magnetic Observatory of Mexico; Camilo A. Gonzales, Director-General of Mexican Telegraphs; Mr. Maxwell Hall, Government Meteorologist, Kingston, Jamaica; Capt. S. I. Kimball, Superintendent of the United States Life-Saving Service; Commander Chapman C. Todd, Hydrographer, United States Navy; H. Pittier, Director of the Physico-Geographic Institute, San Jose, Costa Rica; Captain François S. Chaves, Director of the Meteorological Observatory, Ponta Delgada, St. Michaels, Azores, and W. M. Shaw, Esq., Secretary, Meteorological Office, London.

Attention is called to the fact that the clocks and self-registers at regular Weather Bureau stations are all set to seventy-fifth meridian or eastern standard time, which is exactly five hours behind Greenwich time; as far as practicable, only this standard of time is used in the text of the REVIEW, since all Weather Bureau observations are required to be taken and recorded by it. The standards used by the public in the United States and Canada and by the voluntary observers are believed to conform generally to the modern international system of standard meridians, one hour apart, beginning with Greenwich. The Hawaiian standard meridian is 157° 30′ or $10^h\ 30^m$ west of Greenwich. Records of miscellaneous phenomena that are reported occasionally in other standards of time by voluntary observers or newspaper correspondents are sometimes corrected to agree with the eastern standard; otherwise, the local standard is mentioned.

Barometric pressures, whether "station pressures" or "sea-level pressures," are now always reduced to standard gravity, so that they express pressure in a standard system of absolute measures.

FORECASTS AND WARNINGS.

By Prof. E. B. GARRIOTT, in charge of Forecast Division.

Forecasts of the force and direction of the wind and the state of the weather covering the first three days of the route of steamers from New York and Boston bound for European ports were made daily during the month and printed on the weather maps issued at Boston, New York, Philadelphia, Baltimore, and Washington. On the 5th and 7th special forecasts were issued to the effect that steamers bound west from European ports would encounter severe gales during the second and third days out. During the periods referred to gales of exceptional severity prevailed from mid ocean to the American coast.

The first important storm of the month appeared on the south Pacific coast on the morning of the 1st, whence it passed east-northeast and disappeared off the New England coast during the 4th. Following the passage of this storm freezing temperature occurred in the central valleys of California, and frost was reported as far south as San Diego. In advance of the storm center snow fell generally in the middle-western States and in the middle and eastern districts north of the Ohio River and Maryland. On the Atlantic coast north of Hatteras high winds attended the passage of the storm, with maximum velocities ranging from 50 to 60 miles an hour on the New Jersey and south New England coasts. Attending the area of high barometer which swept southward over the Missouri, Mississippi, and Ohio valleys in the rear of the storm the temperature fell to zero to the southern line of Nebraska on the morning of the 4th, light frost occurred on the middle coast of the Gulf of Mexico on the morning of the 5th, and heavy frost was reported at Jacksonville, Fla., on the morning of the 6th. The frosts of the 2d in California were accurately forecast. Warnings of heavy snow were telegraphed on the 2d to railroad and transportation companies in the region threatened with heavy snow, and additional advices were sent on the 2d and 3d stating that cold weather would follow the passage of the storm. Ample warning was given of the Atlantic coast gales, and of the frosts in the Gulf and South Atlantic States.

The second noteworthy storm of the month crossed the Continent from the 5th to the 9th. This storm appeared over the north California coast on the morning of the 5th, moved thence south of east to the southern Rocky Mountain slope and Texas by the night of the 7th, and from that region drifted eastward and northeastward to the Atlantic coast by the 9th. Heavy rains ended in California during the day and night of the 5th, and heavy snow had fallen in the mountains of central and southern California. With the eastward

advance of the storm center heavy snow fell in the middle-western States and from the upper Mississippi Valley over the Lake region and the interior of the North Atlantic States. Special warnings of heavy snow were telegraphed throughout the districts named on the 7th and 8th, and advices were also given in connection with the marked fall in temperature which followed the passage of the storm, and of the high winds which it caused along the Atlantic coast.

A third well-marked storm appeared over California on the 8th; rain, however, set in along the coast on the 7th, and during the night of the 7th the rain became general and heavy over the State, with snow in the mountain districts. By the morning of the 9th the center of this disturbance had shifted to a position off the southern California coast, whence it apparently passed eastward over northern Mexico during the 10th. On the morning of the 9th killing frost occurred in central and northern California, and on the 10th special frost warnings were issued for southern California and Arizona. Heavy to killing frosts occurred generally in southern California on the morning of the 11th.

On the morning of the 23d the following special warning was telegraphed to Jacksonville, Fla., with instructions to give it the widest possible distribution throughout the State:

Temperature will fall to-night to a minimum of between 20° and 25° at Jacksonville, and to freezing as far south as Tampa, with frost extending somewhat south of the latitude of Jupiter.

Frost occurred as predicted, and the minimum at Tampa, Fla., the night of the 23d was 32°.

The following report on the cold wave warning has been made by Mr. A. J. Mitchell, official in charge United States Weather Bureau office, Jacksonville, Fla.

Referring to the cold wave warnings on the 23d and 24th ultimo, and the disposition made of the same by this office, I have the honor to report that action was taken immediately on the receipt of your telegram, with the view of widely disseminating the information. Nearly three hundred telegrams were sent from this office, which, in conjunction with the energetic measures taken by the various railways in the State, resulted in a gratifying distribution of the warnings throughout the State. Although the warnings were fully verified, it is, nevertheless, a cause for congratulation that minimum temperatures were not such as to prove disastrous to the very large fruit and vegetable interests in this State. As indicated by the phraseology of the message, freezing weather prevailed as far south as Tampa, Fla., with a sharp frost southward to Dade County. Past experience has taught fruit and vegetable growers that the month of February is a hapless one for their interests, and the far reaching measures put in force with the view of protecting crops, amply testify to the necessity for the same, as well as their abiding faith in the forecasts and warnings of the Weather Bureau. Protective measures, now employed in this State, are such that had extremely cold weather prevailed, the amount saved would have been enormous. Thousands of tents and sheds are available in north and north-central portions of the State, while quantities of fuel were conveniently placed in the southern section, where the degree of cold is decidedly less, and where open fires have proven sufficiently efficacious. The reports from orange and vegetable growers show that they were prepared to protect, by the methods mentioned above, fruits and vegetables valued at $750,000. The value of orange bloom, vegetables, and strawberries actually saved by the warning is placed by them at $105,550. This is a small sum compared with the amount which would have been saved, had the cold wave been one of great and prolonged intensity. A few excerpts from the many reports received may show how firmly the weather service is established in this State. The official in charge feels secure in asserting that the relation of the Weather Bureau to the various interests of Florida is that of a vital organ to the human system.

"All bloom and new growth were saved under tents and sheds."
"A few degrees colder or a longer duration of cold would have killed trees without protection. The warning saved them."
"Warnings were effectual in saving thousands of dollars. Thanks."
"The service is greatly appreciated."
"Many beans would have remained unprotected but for the warning. Do not fail to continue the service."
"Everything was saved. The weather service is of great benefit."
"Warning saved a large quantity of berries.
"Vegetable growers appreciate and are governed very much by the service."
"Everyone was prepared to protect, and the warning concentrated the forces."
"I consider the warnings of the greatest importance."
"Weather reports are of incalculable benefit to our people."
"The warning was of very great value. Weather reports are very much appreciated here."
"Please continue sending special reports."
"It is worth a great deal to this vicinity to get these reports. I hope they will be continued."
"Warnings are valuable as they have saved much to growers."
"Our people watch this office every day for reports, and would be greatly disappointed to have them discontinued. They are a great help to us."
"The warning enabled us to 'fire' and otherwise protect two hundred acres of young grove, saving even the tenderest growth."
"People here appreciate weather reports and wait for them daily."
"The value of the service is amply demonstrated."
"Reports are looked for very anxiously daily."
"People appreciate these reports and wait for them."
"Weather forecasts are of inestimable value to orange growers. Without them we might as well give up business."
"Warnings are very profitable to orange growers and 'truckers.'"
"I want to express our estimate of the value and also our high appreciation of the excellent service of the Weather Bureau. The success of the orange industry in this vicinity depends largely upon you. I want to thank you, also, for the daily charts. I find them valuable, and feel that they are indispensable to the success of my operations here."

The manner of disseminating frost warnings and the methods employed in protecting fruit from frost in Florida is described as follows in the Chicago Record of February 28, 1901:

Bellair, Fla., February 25.—The United States Weather Bureau people sent a bulletin into Florida on Saturday last which created the greatest activity among the army of orange and pineapple growers from the Georgia line to Key West. The Weather Bureau predicted that there would be a freeze as far south as Tampa, and frost farther south. Twenty minutes after the warning came thousands of teams were galloping along the roadways leading to pine forests. There was such a bustle as one sees after a fire alarm has been struck. The wagons were loaded with pine knots, logs, and wood of all kinds and hauled at a run to the orange orchards. The stuff is arranged in piles north of the orchard and set on fire. Thousands of acres of fruit trees were saved by this kind of night work, which was general all over the orange-growing sections.

Still another army of workers were made busy by the weather bulletin. They were the men, women, and children who attend to the orange tree tents, for thousands of orange trees are now protected by canvass which covers the whole tree. In fine weather the canvass is rolled back so that the tree is exposed to the sunshine, but when Professor Moore sends his note of warning a whole household will sally forth to close up the tents. Inside the tent one or two kerosene lamps are lighted, which sufficiently heat the air to prevent a freeze. The same warning serves to interest the pineapple people. Their patches of plants are mainly inclosed and covered with slats nailed on stringers 6 feet overhead. The space between the slats lets in the sunshine during fine weather. When a cold wave is signaled the "hands" run out a canvass screen which slides on wires just under the slats, working on the principle of a shade in a photograph gallery. By means of these screens an acre—indeed sometimes five or six—are closed up and the plants kept snug and warm by means of fires lighted in different places within the inclosure.

A period of heavy rains began in the North Pacific coast States on the 12th and continued through the 15th, causing slight freshets in the Willamette River and tributaries. These rains attended the passage of areas of low barometer eastward over British Columbia on the 13th and 15th. Heavy rains and warm weather about the middle of the month also caused a marked rise in the rivers of California. The rises in the rivers of the Pacific slope were anticipated by special warnings.

CHICAGO FORECAST DISTRICT.

The first storm of the month crossed the southern Rocky Mountain region on the 2d, and its center moved forward along the middle Mississippi and Missouri valleys during the 3d. It was accompanied by unusually heavy snow and high winds in portions of the Missouri and middle Mississippi valleys and the upper Lake region. Warnings of heavy snow were issued on the evening of the 2d, and on the morning of the 3d supplementary messages were sent out containing ad-

ditional information regarding cold weather. The second storm moved across the Rocky Mountains on the 7th, and over the central valleys on the 8th. This storm caused more extensive precipitation than the preceding one. Heavy snow warnings were issued in advance of the movement of the storm, and were completely verified.

The Bureau received warm commendation from all sides for the excellent work done in connection with these two large snowstorms.

The movement of cold waves in the district during the month was generally gradual, but when sudden changes occured warnings were given well in advance. The temperature forecasts were carefully followed by shippers of perishable goods and transportation companies and were of much value. Long range forecasts for continued cold weather were made frequently with much success.—*H. J. Cox, Professor.*

Under date of February 21, in its editorial columns, the Chicago Chronicle said:

> Our compliments to the gentleman in the tower of the Auditorium Hotel upon the accuracy of his prognostications during the last three weeks or so. No better example of the science of weather forecasting could be desired. Every prediction has been entitled to be marked "verified," even to the very difficult feat of foretelling the temperature during the night. We doubt if the month's record of the local forecaster has been equaled anywhere since the establishment of the Weather Bureau. It certainly has not been excelled, because no higher excellence is possible than the fulfillment of all predictions.

SAN FRANCISCO FORECAST DISTRICT.

Killing frosts occurred generally in southern California on the morning of the 2d and were accurately forecast. A succession of low areas passed rapidly southward on the Pacific coast during the first week in February. These were accompanied by general and heavy rains. Advisory messages were sent to Los Angeles and San Diego on the morning of the 5th, of high southerly winds. These were verified. On Sunday, February 10, special frost warnings were issued for southern California and Arizona. Heavy to killing frosts occurred in southern California on the morning of the 11th. Heavy rains occurred over northern California. Combined with warm weather, these gave the forecast official reason to believe that a marked rise in the rivers would occur in a few days. Special warnings were sent to Colusa. On the morning of the 20th special river reports were called for from all points along the Sacramento River. Reports of the condition of the rivers were published and warnings of high water in the Basin were distributed generally through the press. The Sacramento River continued to rise, reaching a crest of 28.2 feet on February 25. The crest of the flood was accurately forecast.—*A. G. McAdie, Forecast Official.*

PORTLAND, OREG., FORECAST DISTRICT.

No severe storms or other unusual weather conditions occurred in this district during the month.

Brisk and high winds of short duration occurred along the Washington coasts on several occasions, all of which were successfully forecast.

Heavy rains from the 13th to the 16th caused a slight rise in the Willamette River and tributaries, and forecasts covering the expected rise were issued from the 14th to the 20th.—*A. B. Wollaber, Acting Forecast Official.*

AREAS OF HIGH AND LOW PRESSURE.

Movements of centers of areas of high and low pressure.

Number.	First observed.			Last observed.			Path.		Average velocities.	
	Date.	Lat. N.	Long. W.	Date.	Lat. N.	Long W.	Length.	Duration.	Daily.	Hourly.
High areas.		°	°		°	°	*Miles.*	*Days.*	*Miles.*	*Miles.*
I	2, a. m.	39	82	3, a. m.	43	74	523	1.0	525	21.9
II	2, p. m.	53	108	7, a. m.	39	82	1,950	4.0‡	488	20.3
III	7, a. m.	53	122	8, p. m.	50	97	1,075	1.5	717	29.9
IV	8, a. m.	41	105	11, a. m.	38	78	1,550	2.5‡	620	25.8
V	9, p. m.	54	114	14, a. m.	48	85	1,375	3.0§	458	19.1
VI	14, a. m.	48	125	15, p. m.	50	99	1,200	1.5	800	33.3
VII	17, a. m.	53	121	22, a. m.	21	71	3,775	4.0†	944	39.4
VIII	22, p. m.	35	102	25, p. m.	32	64	2,400	3.0	800	33.3
IX	27, a. m.	42	93	1, a. m.*	32	64	1,750	2.0	875	36.5
Sums							15,600	22.5	6,227	259.5
Mean of 9 paths							1,733		692	28.8
Mean of 22.5 days									693	28.9
Low areas.										
I	1, a. m.	33	115	9, a. m.	48	54	3,900	7.0†	557	23.2
II	2, a. m.	47	123	11, a. m.	48	54	4,600	9.0	511	21.3
III	7, a. m.	26	97	9, p. m.	32	65	2,100	1.5†	1,400	58.3
IV	7, p. m.	40	122	10, p. m.	33	115	850	2.5‡	340	14.2
V	9, a. m.	53	114	11, a. m.	47	88	1,200	2.0	600	25.0
VI	13, a. m.	49	123	16, p. m.	40	75	2,800	3.5	800	33.3
VII	15, a. m.	49	123	18, a. m.	48	89	1,875	3.0	625	26.0
				18, a. m.	41	74	2,825	3.0	942	39.2
VIII	18, a. m.	33	97	20, a. m.	32	65	1,900	2.0	950	39.6
IX	18, p. m.	41	124	20, a. m	49	123	600	1.5	400	16.7
X	21, a. m.	40	105	25, a. m.	48	54	4,000	4.0	1,000	41.7
XI	21, p. m.	40	109	22, p. m.	32	107	875	1.0	575	24.0
XII	24, a. m.	48	85	28, a. m.	48	54	1,650	3 0†	550	22.9
XIII	23, p. m.	34	112	26, a. m.	28	82	2,000	1.5†	1,333	55.6
XIV	27, p. m.	38	100	2, p. m.*	32	65	2,450	3.0	817	34.0
Sums							33,325	47.5	11,400	475.0
Mean of 15 paths							2,222		760	31.7
Mean of 47.5 days									702	29.2

* March. † Stationary for 1 day. ‡ Stationary for ½ day. § Stationary for ⅔ days.

RIVERS AND FLOODS.

River matters were dull and almost entirely uneventful during the month. Stages, as a rule, were somewhat lower than during January, 1901. A few minor flood warnings were issued in the southern districts from the 4th to the 9th. Nothing serious was anticipated and no damage of consequence occurred. The rivers of the Pacific coast system were also comparatively high during the third week of the month, owing to heavy rains, and stages close to the danger lines were reached. Cautionary advices regarding these rises were issued by the officials in charge of the Weather Bureau offices at San Francisco and Portland.

Ice conditions remained practically unchanged, except in the upper Mississippi River, where the line of total freezing moved southward to below Davenport, Iowa. The Ohio River at Wheeling, W. Va., closed on the 24th, and at the end of the month a gorge still held near the lower portion of the city, although the river was clear above. There was much floating ice along the entire river during the greater portion of the month, but very little in the Mississippi River below the mouth of the Ohio.

The highest and lowest water, mean stage, and monthly range at 132 river stations are given in table VII. Hydrographs for typical points on seven principal rivers are shown on Chart V. The stations selected for charting are: Keokuk, St. Louis, Memphis, Vicksburg, and New Orleans, on the Mississippi; Cincinnati and Cairo, on the Ohio; Nashville, on the Cumberland; Johnsonville on the Tennessee; Kansas City, on the Missouri; Little Rock, on the Arkansas; and Shreveport, on the Red.—*H. C. Frankenfield, Forecast Official.*

CLIMATE AND CROP SERVICE.

By JAMES BERRY, Chief of Climate and Crop Service Division.

The following extracts relating to the general weather conditions in the several States and Territories are taken from the monthly reports of the resective sections of the Climate and Crop Service. The name of the section director is given after each summary.

Precipitation is expressed in inches and temperature in degrees Fahrenheit.

Alabama.—The mean temperature was 43 0°, or 3.4° below normal; the highest was 74°, at Gadsden on the 17th and at Citronelle and Healing Springs on the 18th, and the lowest, 11°, at Oneonta on the 24th. The average precipitation was 4.13, or 0.96 below normal; the greatest monthly amount, 7.70, occurred at Elba, and the least, 1.36, at Daphne.

Heavy snow on the 22–23d, ranging from 9 inches in central counties to light in northern and southern portions, doing considerable damage to fruit trees and shrubbery in causing breakage of limbs, but affording a protective covering for wheat and oats against the cold weather which immediately followed.—*F. P. Cheffee.*

Arizona.—The mean temperature was 50.3°, or 0.2° above normal; the highest was 92°, at Mohawk Summit on the 27th and 28th, and the lowest, zero, at Flagstaff on the 14th. The average precipitation was 2.35, or 0.85 above normal; the greatest monthly amount, 8.36, occurred at Flagstaff, and the least, 0.16, at Vail.

Excessive rainfall occurred at Yuma on the 10th, 2.52 inches falling in twenty-two hours and fifteen minutes. Citrus and deciduous fruits are in a forward stage of development.—*W. G. Burns.*

Arkansas.—The mean temperature was 40.8°, or 2.2° below normal; the highest was 79°, at Texarkana on the 18th, and the lowest, 10°, at Pond on the 23d and 24th. The average precipitation was 2.18, or 0.91 below normal; the greatest monthly amount, 4.45, occurred at Camden, and the least, 0.74, at Mossville.

The weather for the past month has been favorable for early farm work, and some spring plowing has been done. Potatoes have been planted, and oats and other grains sown. Wheat is generally in good condition, but in some localities has been slightly damaged by freezing.—*E. B. Richards.*

California.—The mean temperature was 47.7°, or 0.8° above normal; the highest was 98°, at Palm Springs on the 27th, and the lowest 26° below zero, at Bodie on the 10th. The average precipitation was 6 03, or 2.73 above normal; the greatest monthly amount, 22.45, occurred at Cisco, and the least, 0.25, at Keeler.

The abnormally low temperature, with severe frosts, during the first half of the month caused but little injury and checked too rapid development of fruit buds. Heavy rains and warmer weather toward the close benefited grain and pastures. Much of the heavy snow in the mountains melted during this period, causing high water in some sections, but crops were not seriously damaged.—*G. H. Willson.*

Colorado.—The mean temperature was 27.0°, or about normal; the highest was 79°, at Blaine on the 14th, and the lowest, 31° below zero, at Wagon Wheel Gap on the 3d. The average precipitation was 0 63, or 0 39 below normal; the greatest monthly amount, 4 06, occurred at Ruby, and the least, trace, at Saguache and Vilas.—*F. H. Brandenburg.*

Florida.—The mean temperature was 55 8°, or 3 6° below normal; the highest was 88°, at Miami on the 9th, and the lowest, 20°, at De Funiak Springs on the 24th. The average precipitation was 4.44, or 0.76 above normal; the greatest monthly amount, 11.32, occurred at Stephensville, and the least, trace, at Miami.

Fruits and vegetables made a steady advance during the month, although the cold wave of the 24th and 25th did considerable damage to tender vegetables, strawberries, and unprotected fruit trees, where the bloom was well advanced. Aside from the advantage gained by extensive protective measures, the weather following the cold wave was almost ideal and all crops made rapid progress. At the close of the month general agricultural operations were being pushed. Considerable corn was planted during the last decade of the month; in some instances the germination has been very satisfactory and the crop is looking well. Cane has advanced. Land for cotton has been prepared and planting will begin within a few days in portions of central counties.—*A. J. Mitchell.*

Georgia.—The mean temperature was 44.1°, or 4.3° below normal; the highest was 76°, at Fleming, Jesup, and Valona on the 18th, and the lowest, 9°, at Allentown on the 24th and at Dahlonega on the 25th; the average precipitation was 4 30, or 0.67 below normal; the greatest monthly amount, 8.52, occurred at Fort Gaines, and the least, 2.44, at Waynesboro.

The weather was favorable to agricultural interests, except that excessive rains delayed preparatory work in southern and western counties. Farmers are in advance of the season generally, and are laboring under advantageous circumstances. Fruit trees were not injured by cold weather.—*J. B. Marbury.*

Idaho.—The mean temperature was 27.9°, or 0.1° below normal; the highest was 69°, at American Falls on the 27th, and the lowest, 28° below zero, at Lake on the 13th. The average precipitation was 1.81, or 0.29 above normal; the greatest monthly amount, 4.84, occurred at Murray, and the least, 0.34, at Lost River.

A severe storm occurred on the 16th, which extended to all parts of the State and caused heavy snow, rain, and gales. On the eastward side of Cœur D'Alene and Bitter Root ranges there was heavy snow, and on the westward side chinook winds preceding heavy rain; no damage was reported.—*S. M. Blandford.*

Illinois.—The mean temperature was 22 5°, or 4 9° below normal; the highest was 70°, at St. John on the 3d, and the lowest, 20° below zero, at Lanark, Martinton, and Yorkville on the 6th. The average precipitation was 1 62, or 0.74 below normal; the greatest monthly amount, 2.95, occurred at Palestine, and the least, 0.54, at Dixon

Cold weather and absence of snow covering caused some damage to wheat in the central and southern district. Quite deep snow prevailed throughout the month in the northern district.—*M. E. Blystone.*

Indiana.—The mean temperature was 23.4°, or 5.0° below normal; the highest was 68°, at Mount Vernon on the 18th, and the lowest, 13° below zero, at Auburn on the 7th. The average precipitation was 1.64, or 1 16 below normal; the greatest monthly amount, 2.98, occurred at Vevay, and the least, 0 41, at Topeka.

Cold weather prevailed. In the north portion snow covered wheat, and it is possibly in good condition, but in the south portion wheat was not covered by snow at any time and was injured by freezing and the fly; many fields look brown; rye, clover, and grasses are in fair condition; some corn fields are ready for seeding.—*C. F. R. Wappenhans.*

Iowa.—The mean temperature was 17.5°, or 4.0° above normal; the highest was 49°, at Bedford on the 17th, and the lowest, 21° below zero, at Iowa City on the 10th. The average precipitation was 1.01, or about normal; the greatest monthly amount, 3.00, occurred at Ruthven, and the least, 0.12, at Murray.

February was an ideal winter month for care of stock and for farm operations usually carried on in midwinter, with no severe storms or marked extremes of temperature. No damage reported to grasses, fruit trees, vines, or winter wheat and rye.—*John R. Sage.*

Kansas.—The mean temperature was 28.0°, or 2.2° below normal; the highest was 78°, at Ulysses on the 28th, and the lowest, 16° below zero, at Achilles on the 9th. The average precipitation was 1.25, or 0.14 above normal; the greatest monthly amount, 2.55, occurred at Marion, and the least, 0.22, at Englewood.

The weather has been quite favorable for wheat growing and seed in the ground, the latter beginning to germinate the last week. Plowing continued in many southern and some western counties. Oat sowing began in Montgomery County the last days. At close of month fruit buds were good, and in Sumner and Wilson counties pastures were green.—*T. B. Jennings.*

Kentucky.—The mean temperature was 32.4°, or 2.7° below normal; the highest was 71°, at Paducah on the 17th, and the lowest, 1°, at Catlettsburg on the 24th. The average precipitation was 1.27, or 2.35 below normal; the greatest monthly amount, 2.48, occurred at Blandville, and the least, 0.40, at Centertown and Manchester.

During February wheat was without snow protection, and was further damaged by alternate freezing and thawing; injury from freezing is general, and many fields have been damaged by fly. A large amount of plowing for corn has been done. Tobacco beds are being prepared. Fruit is uninjured.—*H. B. Hersey.*

Louisiana.—The mean temperature was 50.1°, or 2.5° below normal; the highest was 85°, at Lake Providence on the 18th, and the lowest, 10°, at Plain Dealing on the 23d. The average precipitation was 5.39, or 0.41 above normal; the greatest monthly amount, 9.05, occurred at White Sulphur Springs, and the least, 2.45, at Plain Dealing.

The cold wave of February 22–25, following a period of warm, sunshiny weather, which had started the sap in fruit trees and advanced some plants further than is usual at this season of the year, injured the peaches in places, killed some strawberries and early vegetables and retarded the development of the early strawberry crop one to two weeks. Otherwise the weather during the month was favorable to agricultural interests, and farm work was well advanced at the close of the month.—*W. T. Blythe.*

Maryland and Delaware.—The mean temperature was 27.5°, or 4.4° below normal; the highest was 69°, at Sharpsburg, Md., on the 16th, and the lowest, 6° below zero, at Deerpark, Md., on the 23d. The average precipitation was 0.77, or 3.06, below normal; the greatest monthly amount, 2.39, occurred at Sunnyside, Md., and the least, 0.10, at Chase, Md., and Charlotte Hall, Md.

The month was dry and windy. The deficiency in precipitation is

being severely felt in some districts, and many wells and springs have failed. The deficiency in temperature was due to prolonged but not severe cold spells. In the northern counties ample snow covering protected wheat until about the middle of February, but farther south the entire month was unfavorable to winter grain and grasses. The condition of wheat was less favorable at the close of February than at the close of the month preceding, but least damage had been caused in the more important wheat producing counties.—*Oliver L. Fassig.*

Michigan.—The mean temperature was 14.2°, or 5.7° below normal; the highest was 44°, at Houghton and Baraga on the 28th, and the lowest, 26° below zero, at Humboldt on the 3d. The average precipitation was 1.39, or 0.57 below normal; the greatest monthly amount, 4.60, occurred at Berrien Springs, while none fell at Thomaston.—*C. F. Schneider.*

Minnesota.—The mean temperature was 10.0°, or 1.5° below normal; the highest was 56°, at Beardsley on the 13th, and the lowest, 38° below zero, at Pokegama on the 6th. The average precipitation was 0.40, or about 0.25 below normal; the greatest monthly amount, 1.00, occurred at Leroy, and the least, 0.02, at New London.

The average temperature for the whole State was about 1.5° below the normal, though in western Minnesota the average was above the normal. There were moderately high temperatures from the 13th to the 18th. The lowest temperatures occurred on the 5th, 6th, and 22d. In northern portions the temperatures were considerably below zero every night except from the 13th to the 18th, but in southern portions zero was not reached on many nights. The deficiency in the monthly average temperature seems to have been due more to an absence of high temperatures than to any very low temperatures. Since the 1st of January there has been no general thaw, a fact that has contributed to the making of ice of unusual thickness and of the best quality. The precipitation of the State was deficient about 0.25 of an inch. It is probable that all the precipitation was snow; this fell for the most part on the 7th and 8th and on the 17th. The snow was sufficient in the timber regions for work, which, with the steady cold weather, has made the season a very favorable one for the lumbermen. Snow has covered the State all the month, but in the prairie regions it was light and generally insufficient for good sleighing.—*T. S. Outram.*

Mississippi.—The mean temperature was 45.7°, or 3.1° below normal; the highest was 80°, at Natchez on the 18th, and the lowest, 14°, at Saratoga on the 24th. The average precipitation was 4.37, or 0.43 below normal; the greatest monthly amount, 8.24, occurred at Water Valley, and the least, 1.65, at Hernando.

The snowfall of the 22d and 23d amounted to over 7 inches in the central and east central counties.—*W. S. Belden.*

Missouri.—The mean temperature was 27.9°, or 2.7° below normal; the highest was 76°, at Appleton City on the 17th, and the lowest, 19° below zero, at Bethany on the 10th. The average precipitation was 1.63, or 0.66 below normal; the greatest monthly amount, 5.04, occurred at Sikeston, and the least, 0.50, at Windsor.

In most of the northern counties winter wheat was well protected by snow during the greater part of the month, but in the central and southern sections the fields were generally bare and some damage resulted from alternate freezing and thawing. In general, however, the crop continued in good condition.—*A. E. Hackett.*

Montana.—The mean temperature was 19.5°, or 1.4° below normal; the highest was 68°, at Miles City on the 28th, and the lowest, 26° below zero, at Poplar on the 4th and at Wibaux on the 4th and 5th. The average precipitation was 0.61, or 0.06 below normal; the greatest monthly amount, 2.44, occurred at Clemons, and the least, trace, at Chester.—*E. J. Glass.*

Nebraska.—The mean temperature was 21.4°, or 2.7° below normal; the highest was 70°, at Madrid on the 16th and at Arborville on the 28th, and the lowest, 29° below zero, at Gering on the 9th. The average precipitation was 0.83, or 0.14 above normal; the greatest monthly amount, 1.68, occurred at Minden, and the least, 0.25, at Bartley and Norfolk.

A favorable month for winter wheat.—*G. A. Loveland.*

Nevada.—The mean temperature was 31.9°, or 0.9° above normal; the highest was 77°, at Candelaria on the 28th, and the lowest, 27° below zero, at Elko on the 11th. The average precipitation was 2.61, or 1.79 above normal; the greatest monthly amount, 7.93, occurred at Lewers Ranch, and the least, 0.35, at Potts.

The outlook is very bright for plenty of water this year.—*J. H. Smith.*

New England.—The mean temperature was 18.0°, or 5.1° below normal; the highest was 49°, at New Bedford, Mass., on the 17th, and the lowest, 23° below zero, at Grafton, N. H., on the 2d. The average precipitation was 0.96, or 2.48 below normal; the greatest monthly amount, 3.65, occurred at Enosburg Falls, Vt., and the least, 0.18, at Northfield, Vt.

The weather of the month was unusually pleasant, with a superabundance of sunshine. Precipitation occurred on an average of but 4 days, and the average number of clear days for the entire section was 15. Notable features of the weather of the month were the absence of rainfall and the continuous northwest winds through the month in all sections of the district. There were no destructive storms.—*J. W. Smith.*

New Jersey.—The mean temperature was 25.4°, or 6.0° below normal; the highest was 52°, at Bridgeton and Salem on the 16th, and the lowest, 6° below zero, at Rivervale on the 1st and at Layton on the 11th; the average precipitation was 0.94, or 3.11 below normal; the greatest monthly amount, 1.65, occurred at Toms River, and the least, 0.69, at Newark.

The average precipitation for the month is the least recorded since the establishment of this service, and is the lowest recorded at New Brunswick during February for the past 36 consecutive years. Wells, springs, and streams were never known to be so low. Farmers are hauling water for domestic and stock purposes. Wheat and rye are not in good condition, owing to frequent freezing and thawing during December and January.—*E. W. McGann.*

New Mexico.—The mean temperature was 38.2° or 1.1° above normal; the highest was 81°, at Mesilla Park on the 21st, and the lowest, 6° below zero, at Winsors on the 8th. The average precipitation was 0.93, or 0.42 above normal; the greatest monthly amount, 2.25, occurred at Winsors, and the least, 0.22, at Espanola.

Unusually warm and pleasant weather, with more than the average precipitation. Soil in excellent condition and some early plowing done.—*R. M. Hardinge.*

New York.—The mean temperature was 16.1°, or 6.8° below normal; the highest was 46°, at Wappingers Falls on the 16th, Carvers Falls on the 19th, and at Catskill and Primrose on the 26th, and the lowest, 29° below zero, at Axton on the 8th. The average was 1.44, or 1.11 below normal; the greatest monthly amount, 5.08, occurred at North Lake, and the least, 0.05, at Catskill.

The month was unusually cold, with high westerly winds and light precipitation. Wheat and rye were protected by snow during the entire month, and were in good condition at its close.—*R. G. Allen.*

North Carolina.—The mean temperature was 38.1°, or 5.2° below normal; the highest was 77°, at Newbern on the 18th, and the lowest, 3°, at Flat Rock and Linville on the 3d. The average precipitation was 1.93, or 2.41 below normal; the greatest monthly amount, 4.39, occurred at Sloan, and the least, 0.86, at Louisburg.

The month was rather unfavorable for winter wheat, which was considerably injured by alternate freezing and thawing. The drought also prevented spreading, and the condition of the crop was backward at the end of February. Much of the damage is attributed to ravages by hessian fly earlier in the season, and not enough appears to be winter killed to prevent good stands when growth starts. The snow storm on February 23 gave a depth of 9 inches unmelted snow over the southeast section from Washington, N. C., to Wilmington, but almost none in the west.—*C. F. von Herrmann.*

North Dakota.—The mean temperature was 7.1°, or 0.5° above normal; the highest was 60°, at Berthold Agency on the 13th, and the lowest, 31° below zero, at Portal on the 4th. The average precipitation was 0.31, or 0.17 below normal; the greatest monthly amount, 0.88, occurred at Fort Yates, and the least, trace, at Melville and Willow City.—*B. H. Bronson.*

Ohio.—The mean temperature was 21.1°, or 7.2° below normal; the highest was 60°, at Sinking Springs on the 17th, and the lowest, 20° below zero, at Orangeville on the 23d. The average precipitation was 1.24, or 1.57 below normal; the greatest monthly amount, 2.90, occurred at Pulse, and the least, 0.45, at Moorefield.

The average temperature was lower than in any previous February on record, with but two exceptions—1885 and 1895. The precipitation was very light, there being only one year, 1895, when it was more deficient.—*J. Warren Smith.*

Oklahoma and Indian Territories.—The mean temperature was 37.6°, or 0.1° above normal; the highest was 82°, at Colbert on the 28th, and the lowest, 1° below zero, at Kenton on the 23d. The average precipitation was 0.94, or 0.23 below normal; the greatest monthly amount, 2.05, occurred at Tahlequah, and the least, trace, at Woodward.

Normal temperature and slightly deficient rainfall characterized the month. Snow occurred on the 6th, 10th, 22d, and other dates, the average for the section being 2 inches. While the ground is very dry, there appears to be sufficient moisture in the subsoil for the present and immediate future. A good rain, however, would be of great benefit. Wheat is still in good condition, and cattle are healthy and in good flesh; farm work was well advanced.—*Charles M. Strong.*

Oregon.—The mean temperature was 39.9°, or 0.6° above normal; the highest was 76°, at Monmouth on the 28th, and the lowest, 8° below zero, at Prineville on the 4th and at Riverside on the 8th. The average precipitation was 5.78, or 0.63 above normal; the greatest monthly amount, 15.81, occurred at Nehalem, and the least, 0.80, at Joseph.

The weather has been favorable for the growth of vegetation of all kinds, especially grasses and small grains.—*A. B. Wollaber.*

Pennsylvania.—The mean temperature was 21.7°, or 6.9° below normal; the highest was 57°, at Greensboro on the 18th, and the lowest, 22° below zero, at Saegerstown on the 23d. The average precipitation was 0.96, or 2.36 below normal; the greatest monthly amount, 2.75, occurred at Cassandra, and the least, 0.27, at Chambersburg.

Weather conditions have been excellent for grain. February opened with a blanket of snow covering the entire State. On the level the depth varied from a few inches in the southeastern quarter to over 2

feet at some points in the northwest. High winds caused heavy drifts at many places, though traffic was interfered with but little. Wheat and rye remained well covered and protected during the greater part of the month, as snow melted but slowly under the influence of continued cold weather. Only patches here and there in exposed fields became bare early in the month from the effects of high winds, principally upon hillsides. Grain is reported poorer in the east and southeast sections than elsewhere. In those sections fields were bare during a considerable part of the winter, and damage from the hessian fly was also reported. At the close of February the condition of wheat and rye over the greater portion of the State was apparently fully up to the average.—*L. M. Dey.*

Porto Rico.—The mean temperature was 74.9°, or 1.9° above normal; the highest was 96°, at Bayamon on the 23d, and the lowest, 52°, at Cayey on the 8th, 13th and 14th, Cidra on the 13th, and Juana Diaz on the 1st. The average precipitation was 1.39, or 0.96 below normal; the greatest monthly amount, 5.70, occurred at Coamo, and the least, 0.09, at Caguas.

The grinding of sugar cane continues and the weather has been very favorable. Cane is maturing nicely, but the grade of the juice is slightly below the average and not as good as was anticipated. Some new cane is being planted, but the ground is rather dry for this work; the crop is needing rain to insure a good stand, otherwise it is doing well. Tobacco cutting is progressing favorably; the crop is small, but the quality is good. Coffee trees are flowering exceptionally well and a good crop is promised, but some plantations are in need of cultivation. Pastures and small crops are needing rain, especially over the western portion of the island, where the drought continues. Small crops have not done as well as they did during the month of January; marketing continues, but the supply is not as plentiful as last month.—*Joseph L. Cline.*

South Carolina.—The mean temperature was 43.2°, or 3.1° below normal; the highest was 78°, at Gillisonville on the 18th, and the lowest, 7°, at Temperance on the 23d. The average precipitation was 3.08, or 1.32 below normal; the greatest monthly amount, 5.40, occurred at Georgetown, and the least, 1.28, at Winnsboro.

Snow occurred on the 23d over the entire State; the snowfall was light over the western, and heavy over the southeastern and eastern portions, followed on the 24th and 25th by ground freeze. Preparation of lands for spring planting well advanced.—*J. W. Bauer.*

South Dakota.—The mean temperature was 16.4°, or 1.0° above normal; the highest was 71°, at Rosebud on the 28th, and the lowest, 25° below zero, at Pine Ridge on the 9th. The average precipitation was 0.35, or 0.15 below normal; the greatest monthly amount, 1.40 occurred at Oelrichs, and the least, trace, at Bowdle, Canton, and Ipswich.—*S. W. Glenn.*

Tennessee.—The mean temperature was 36.7°, or 3.3° below normal; the highest was 75°, at Springdale on the 18th, and the lowest, 5°, at Silverlake on the 25th. The average precipitation was 1.87, or 2.69 below normal; the greatest monthly amount, 3.10, occurred at Iron City, and the least, 0.79, at Knoxville.

The month was rather unfavorable for winter grain crops. Alternate freezing and thawing had bad effect on wheat, which made little or no progress. The very light snowfall did not give sufficient protection, and the prospect at the close of the month was anything but flattering. In a few counties winter wheat was reported in fair condition, but generally it was much below the average for this period. The seeding of oats, plowing and preparation for planting corn, also other farm work, progressed favorably during the month.—*H. C. Bate.*

Texas.—The mean temperature was 48.1°, or 3.5° below normal; the highest was 92°, at Fort Ringgold on the 28th, and the lowest, zero, at Mount Blanco on the 12th. The average precipitation was 1.78, or about normal; the greatest monthly amount, 6.06, occurred at Trinity, while none fell at Fort Brown and Sanderson.

Wheat was suffering for rain at the opening of the month, but showers, with 3 to 4 inches of snow in many localities, proved exceptionally favorable to this crop. Good growth has been made and the crop is promising except in a few scattered localities where the precipitation has not yet been sufficient for the needs of the plant. Preparations for corn planting have been pushed forward with rapidity under auspicious conditions. Planting is well under way over the southern portion of the State, and will be commenced over the central portion soon. The preparation of land for the next cotton crop is receiving attention, and for the season of the year is well advanced. The weather has been exceptionally favorable for plowing. Oat seeding was completed during the month. The crop is generally up to good stands, and is in a promising condition.

Utah.—The mean temperature was 31.0°, or 1.9° above normal; the highest was 75°, at St. George on the 28th, and the lowest, 26° below zero, at Lund on the 13th. The average precipitation was 1.90, or 0.74 above normal; the greatest monthly amount, 4.80, occurred at Tropic, and the least, 0.33, at Giles.—*L. H. Murdoch.*

Virginia.—The mean temperature was 31.9°, or 5.3° below normal; the highest was 69°, at Buckingham, Bigstone Gap, and Fontella on the 18th, and the lowest, 1°, at Hot Springs on the 1st. The average precipitation was 0.75, or 3.08 below normal, the greatest monthly amount, 2.51, occurred at Callaville, and the least, trace, at Stanardsville.

No severe storms occurred, but the cold, dry weather obtaining was injurious to winter wheat, oats, and clover. The late sown winter wheat especially was much damaged, the root growth being not sufficient to enable it to withstand the bad effects of freezing and thawing.—*Edward A. Evans.*

Washington.—The mean temperature was 35.9°, or about normal; the highest was 71°, at Moxee on the 28th, and the lowest, 9° below zero, at Northport on the 5th. The average precipitation was 4.51, or 0.20 above normal; the greatest monthly amount, 16.09, occurred at Monte Cristo, and the least, 0.94, at Port Townsend.

The fore part of the month was unfavorable to winter wheat, on account of heavy frosts, in the absence of snow. The damage was only slight, however. The latter part of the month was mild and wet, and generally favorable for crops.—*G. N. Salisbury.*

West Virginia.—The mean temperature was 27.1°, or 3.6° below normal; the highest was 62°, at Magnolia on the 16th and at Green Sulphur Springs on the 18th, and the lowest, 6° below zero, at Lewisburg on the 1st. The average precipitation was 0.86, or 2.52 below normal; the greatest monthly amount, 1.66, occurred at Spencer, and the least, 0.10, at Magnolia.

Dry, cold weather, with high winds and practically no snow protection was unfavorable for late sown wheat; early sown looks fairly well, having made good growth during fall and early winter, and is well rooted with good top; feed scarce, but stock wintering fairly well where protected; practically no farm work done, although farmers are getting ready for spring work.—*E. C. Vose.*

Wisconsin.—The mean temperature was 12.0°, or 5.0° below normal; the highest was 42°, at Pepin on the 28th, and the lowest, 26° below zero, at Hayward on the 6th. The average precipitation was 0.81, or 0.45 below normal; the greatest monthly amount, 1.92, occurred at Milwaukee, and the least, 0.25, occurred at Menasha and Spooner.

The month was favorable to winter crops, the abundant snowfall affording ample protection throughout the month.—*W. M. Wilson.*

Wyoming.—The mean temperature was 20.1°, or 1.4° above normal; the highest was 68°, at Fort Washakie and Cody on the 28th, and the lowest, 32° below zero, at Bigpiney on the 13th. The average precipitation was 0.80, or 0.03 above normal; the greatest monthly amount, 2.26, occurred at Centennial, and the least, 0.04, at Fort Washakie.—*W. S. Palmer.*

Cuba.—The mean temperature was 72.4°; the highest was 94°, at San Cayetano, and the lowest, 45°, at Rosario (Aguacate). The average precipitation was 1.39; the greatest monthly amount, 3.07, occurred at Cienfuegos, and the least, trace, at San Cayetano and Soledad (Guantánamo).

The weather was dry and rather cool over Pinar del Rio, Havana, Matanzas, and northwest Santa Clara; seasonal showers and temperature prevailed over remainder of island. Tobacco in Vuelta Abajo suffered severely, yield very short, crop in fair condition elsewhere. Cane grinding, preparation of ground for spring planting, and the cultivation of new canes progressed actively.—*Montrose W. Hayes.*

SPECIAL CONTRIBUTIONS.

ICE CAVES AT FLAGSTAFF, ARIZ.

By Mrs. ELIZABETH RENOE, dated Flagstaff, March 6, 1901.

The ice caves 9 miles southeast of Flagstaff are situated at the base of the mountains, and are thought to be of volcanic origin.

The opening is basin shaped, and only large enough to admit a man entering feet foremost, and dropping from ledge to ledge. In some places the drop is about 8 feet, and the ledge about 4 feet wide. The total depth is about 20 feet. The first chamber is only about 2½ feet high, but gets higher as one proceeds. It extends about 100 yards, where one may stand upright. It is thought that the snow melting on the mountains runs in and becomes frozen with the cold air. At this time of the year it is filled with ice to the entrance, but about July and August only one chamber, the farthest from the entrance, is frozen.

Cart loads of ice were hauled thence the past summer,

taken from the caves with block and tackle. It had to be first lifted from ledge to ledge and then taken out. It is not thought best to make the opening larger as it might interfere with the freezing. A photograph of the inside is not easily taken, and there are none in Flagstaff, though it would be possible to take one by flashlight. A photograph of the outside would convey no idea whatever as it is merely a pile of rocks, and was found by accident.

OBSERVATIONS AT HONOLULU.

Through the kind cooperation of Mr. Curtis J. Lyons, Meteorologist to the Government Survey, the monthly report of meteorological conditions at Honolulu is now made partly in accordance with the new form, No. 1040, and the arrangement of the columns, therefore, differs from those previously published.

Meteorological Observations at Honolulu, February, 1901.

The station is at 21° 18′ N., 157° 50′ W.

Hawaiian standard time is 10h 30m slow of Greenwich time. Honolulu local mean time is 10h 31m slow of Greenwich.

Pressure is corrected for temperature and reduced to sea level, and the gravity correction, −0.06, has been applied.

The average direction and force of the wind and the average cloudiness for the whole day are given unless they have varied more than usual, in which case the extremes are given. The scale of wind force is 0 to 12, or Beaufort scale. Two directions of wind, or values of wind force, or amounts of cloudiness, connected by a dash, indicate change from one to the other.

The rainfall for twenty-four hours is measured at 9 a. m. local, or 7.31 p. m., Greenwich time, on the respective dates.

The rain gage, 8 inches in diameter, is 1 foot above ground. Thermometer, 9 feet above ground. Ground is 43 feet, and the barometer 50 feet above sea level.

Date.	Pressure at sea level.	Temperature.		During twenty-four hours preceding 1 p. m., Greenwich time, or 2.29 a. m., Honolulu time.									Total rainfall at 9 a. m., local time.
				Temperature.		Means.		Wind.			Sea-level pressures.		
		Dry bulb.	Wet bulb.	Maximum.	Minimum.	Dew-point.	Relative humidity.	Prevailing direction.	Force.	Average cloudiness.	Maximum.	Minimum.	
	*	†	†			‡	‡		§				
1	29.90	65	57	75	61	60.7	77	w-ne.	1-3	8-0	29.93	29.85	0.03
2	29.90	59	57	73	61	54.3	64	n-sw.	1-0	0	29.93	29.83	0.00
3	29.86	68	64	77	57	60.5	78	s-ne.	1	1-10	29.94	29.84	0.00
4	29.66	70	64	76	67	60.7	71	nne.	2-4	10	29.89	29.60	0.32
5	29.53	70	67.5	75	65	62.3	70	se-e	5	10-8	29.67	29.52	0.09
6	29.51	69	67	76	68	66.7	84	ss -s.	5-4	10	29.59	29.48	0.53
7	29.58	68	66.7	75	66	67.3	85	ssw-sw.	6-4	9-10	29.57	29.48	1.01
8	29.61	67	65.7	75	66	66.3	89	sw-n.	3-1	10-3	29.68	29.56	1.00
9	29.66	72	64	72	65	65.7	92	sw-w.	2-0	10-7	29.71	29.63	0.30
10	29.62	69	67.5	77	70	62.3	69	sw.	4-2	2-7	29.72	29.62	0.27
11	29.66	71	69.7	77	65	68.3	88	sw-w.	3	10-7	29.69	29.60	0.73
12	29.74	72	68.5	77	69	67.7	85	sw.	3	5-10	29.73	29.68	0.06
13	29.72	71	69.7	73	70	68.3	89	w.	0-1	10	29.82	29.72	2.87
14	29.82	61	58.5	72	68	65.7	92	w-n.	1	10	29.85	29.70	0.54
15	29.93	65	59	73	60	58.3	80	sw-ne.	1	5-1	29.96	29.81	0.05
16	30.03	67	58	74	60	55.3	62	nne.	1-4	4	30.05	29.94	0.04
17	30.09	65	58.5	73	65	57.7	68	ne.	3	6	30.11	30.02	0.02
18	29.98	56	54	72	64	53.5	60	nne.	4-5	1 0	30.11	30.02	0.00
19	29.89	58	57.3	74	55	55.3	73	sw.	0-1	1-5	30.04	29.89	0.00
20	29.80	63	61	77	57	60.3	81	w.	3	4	29.92	29.80	0.00
21	29.81	62	58	77	58	62.3	77	wnw.	4	4	29.86	29.75	0.05
22	29.91	56	54	73	59	54.7	70	nw.	3-1	4-1	29.95	29.80	0 00
23	29.85	68	62.5	73	54	53.5	67	n-s.	1-0	2	29.96	29.84	0.04
24	30.08	56	54.5	75	64	58.7	71	wsw.	2-0	8-0	30.04	29.86	0.01
25	30.08	58	57	75	55	56.0	72	sw-n.	1-0	1-3	30.09	30.00	0.00
26	29.94	64	62.7	76	56	60.3	70	se-sw.	1-0	1-3	30.04	29.93	0.00
27	29.93	64	62.7	78	63	65 0	81	sw.	2-0	1-6	29.99	29.89	0.00
28	30.04	67	64	78	64	63.3	76	sw-ne.	1-3	1-8	30 08	29.91	0.00
Sums.													7.96
Means.	29.822	65.0	61.8	75.0	62.7	61.6	76.5		2.2	5.3	29.890	29.792	
Departure.	−.109					−1.0	+1.6						+2.00

Mean temperature for February, 1901 (6+2+9) ÷ 3 = 68.7; normal is 70.4. Mean pressure for February, 1901 (9+3) ÷ 2 = 29.838; normal is 29.947.

*This pressure is as recorded at 1 p. m., Greenwich time. †These temperatures are observed at 6 a. m., local, or 4.31 p. m., Greenwich time. ‡These values are the means of (6+9+2+9) ÷ 4. §Beaufort scale.

Mean pressure lowest in twenty years. Mean temperature lowest for February with one exception. General elec ric storms throughout the group from the 4th to 15th probably came from the south-southwest, during which time the barome er fell to the lowest point reached in twenty years. Very heavy rains and snow fell on the mountains.

MEXICAN CLIMATOLOGICAL DATA.

Through the kind cooperation of Señor Manuel E. Pastrana, Director of the Central Meteorologic-Magnetic Observatory, the monthly summaries of Mexican data are now communicated in manuscript, in advance of their publication in the Boletin Mensual. An abstract, translated into English measures, is here given, in continuation of the similar tables published in the MONTHLY WEATHER REVIEW since 1896. The barometric means have not been reduced to standard gravity, but this correction will be given at some future date when the pressures are published on our Chart IV.

Mexican data for February, 1901.

Stations.	Altitude.	Mean barometer.	Temperature.			Relative humidity.	Precipitation.	Prevailing direction.	
			Max.	Min.	Mean.			Wind.	Cloud.
	Feet.	*Inch.*	° *F.*	° *F.*	° *F.*	%	*Inch.*		
Chihuahua	4,669	25.30	69.3	33.4	51.4	59	0.16	sw.	w.
Duran o (Sem nario).	6,243	24.02	84.4	29.3	54.9	44	0.24	sw.	w.
Leon (Guanajuato)	5,934	24.31	78.8	37.6	58 5	52	0.63	nw.	sw.
Linares (Nuevo Leon).	1,188	28.75	87.8	35.6	61.5	66	0.24	n.	s.
Mazatlan	25	29.98	79.0	60.3	70.3	77	0.88	nw.	w.
Mexico (Obs. Cent.)	7,472	23.06	72.7	34 2	57.2	48	0.99	n.	
Morelia (Seminario)	6,401	23.98	74.7	33 8	55.6	58	1.50	s.	w.
Puebla (Col. Cat.)	7,112	23.39	73.8	41.9	58.8	54	0.87	e.	sw.
Saltillo (Col. S. Juan).	5,390	24 79	75.2	33 8	55.9	66	0.47	s.	s.
San Luis Potosi	6,202	24.11	75.6	41.0	58.6	61	1.09	sw.	w.
Tampico	38								
Zapotlan (Seminario)	5,078	25.11	81.0	38.5	61.0	53	1.50	sse.	w.

RELATIVE LENGTH OF WARM AND COLD SEASONS.

By HENRY PENNYWITT, dated February 20, 1901.

Charts XI, XII, and XIII have been prepared with the view of determining approximately the length of the warm and cold seasons in various locations, by comparing the daily normal temperatures in spring and autumn with the annual means as computed from records for twenty-five years or less of 135 Weather Bureau stations between 1872 and 1898.

The dates on which the daily normal temperatures in spring equal the annual mean vary according to locality. In the upward progress the daily normals first overtake the annual in the Northwest, in the region including the greater portion of Texas and portions of Arkansas, Oklahoma, and Kansas, where the dates range from about the 5th to the 10th of April; in the Mississippi Valley the dates range from the 10th to the 15th of April; in the region extending from the east Gulf States northward to the Ohio Valley, including the eastern portions of Wisconsin and Illinois, all of Indiana, the most of Ohio, and portions of Pennsylvania and New York, the dates fall between the 15th and 20th of April; in the greater portion of the upper Lake region and in a strip near the Atlantic coast between the 20th and 25th of April; along the middle Atlantic coast and in the lower Lake region after the 25th of April; in the region including western Colorado, Utah, portions of Nevada, New Mexico and Arizona, and in southern California, they occur much later, as late as the 1st to 10th of May in the region last named.

In the autumn, when the temperatures are declining, the daily normals first coincide with the annual mean in the Ohio Valley and Gulf States and in the southern slope of the Rocky Mountain region, where this occurs before the 20th of October; along the Atlantic coast about the 25th of October; along the Pacific coast it occurs after the 1st of November, the latest date being in the vicinity of San Francisco, Cal., or about the 20th of November.

If the year be divided into two seasons, the warm and the cold season (the warm season including the time when the daily normals are above the annual mean and the cold season when they are below), it is found that in the greater portion of the United States the warm season is longer than the cold, the exceptions being in the southern slope of the Rocky Mountain region and in small areas in the lower Lake region and Middle Atlantic States. The longest warm season is in

the northwest and on the middle California coast, where it exceeds the cold season in length of time by from 30 to 50 days. The longest cold season is to be found in the southern slope of the Rocky Mountain region, where the cold exceeds the warm season by about 10 days.

The warm season in Texas and the lower Missouri Valley opens about 10 days earlier than in the region near the Atlantic coast south of the lower Lake region, and from 20 to 25 days earlier than on the southern coast of California, while in the northwest it opens from 20 to 25 days earlier than in the Lake region, and from 15 to 20 days earlier than in the northern Pacific coast region.

There does not appear to be such decided differences in the dates of the setting in of the cold season, except along the Pacific coast, where the coincidence of daily normal and annual mean is delayed much later than over the rest of the country.

THE RAINFALL OF THE LEEWARD AND WINDWARD ISLANDS.

By MARK S. W. JEFFERSON, Elmwood, Mass., Submaster Brockton High School.

Mr. Alexander's notes on the rainfall of St. Kitts, W. I., in the MONTHLY WEATHER REVIEW for November, 1900 are of great interest. I am moved to wonder how far the observations given represent the moisture conditions of the island. During a month down and up the Leeward and Windward islands as far as Trinidad, in 1895, with rambles ashore daily, I learned to regard the inner islands, St. Kitts, Nevis, Montserrat, Guadeloupe, etc., to St. Vincent, as heavily wooded mountain summits with abundant rains, due largely to the elevation to which the trades must rise to pass over them. St. Kitts is one of the northernmost and least luxuriant, yet the woods above Basseterre are difficult to penetrate. On the more southern islands the forests are primeval and quite impenetrable. I have before me a number of photographs of these woods as I write, especially in Dominica and St. Kitts, Antigua, and Barbados. On the other hand I recall as dry clear sky islands to the eastward of the main line, without the high peaks and their cloud curtain, and their open woodless country is associated in my mind with lesser altitude.

The inner islands, while rarely thirty miles in length, are all surmounted by peaks well toward a mile in height, and all through the month of March, 1895, showers chased each other across their slopes, or clouds trailed out from their summits. These appearances are abundantly recorded in chance photographs. The rank forest growth forbids the assumption of an unusual month, while the massive stone arches of the highway bridges everywhere, with the peculiar torrent-paving and rainstorm-bridges of Nevis and St. Kitts, imply violent downpours on occasion. I do not know how many of these pavements there may be in St. Kitts, but I stumbled at once on two of them, one at Old Roads, or on the way thither, and the other I have forgotten where. Of the first I have a photograph before me. They are simply portions of the highway paved with stone blocks where mountain torrents pass in time of showers. At the date of my passing they were without water. Two views of rain bridges are in my collection, one at Old Roads, a stone arch ascended by steps at each end, and furnished with a hand-rail, while a thin stream of water flowed beneath; the other, at Nevis, has steps and round piers of stone with a footway of planks overhead; beneath this no water. I do not remember who told me these bridges were provisions against storms, but I think I was so told, and the fact seemed sufficiently obvious.

Antigua and Barbados, on the contrary, are but 1,300 to to 1,600 feet in height; they are dusty, sunny, and open. Numerous drives assure one that forests either do not exist or are very remote from Georgetown and St. Johns, while there is in both islands a complete absence of that weed tangle, in neglected corners, characteristic of the rain belt. I have supposed that the amount of cooling from expansion induced by this moderate ascent did not induce the trades to give up so much of their moisture. It is my impression that the English regard these two islands as the most agreeable and healthful for residence, not that they are arid but of moderate moisture.

These facts are not at all incompatible with the precipitation figures Mr. Alexander cites, but may, perhaps, be useful to supplement them. What they seem to suggest is that the coastal fringe of plain—an old sea bottom on which Brimstone Hill was a coral reef—receives a rainfall of from 50 to 70 inches, while the mountains above receive a much greater quantity. The constant clouding of Mount Misery compels this belief and all analogy supports it. It is a common defect of rainfall measurements in uneven country that they refer, necessarily, to the low levels inhabited by men. F. H. Newell, in his report on Stream Measurements in 1897, on page 501, cites Cedar River, Washington, as showing:

> A run off of over 102 inches, when compared with the probable precipitation of something over 90 inches at Northbend, which indicates that there must be a considerable increase of precipitation on the mountain slopes, Mr. Noble thinks that the precipitation near the summit of the mountain must be as much as 150 inches a year.

Similarly it is possible that Mount Misery may receive considerably more than 100 inches a year. It will be seen that the steady trades will drive this rainfall toward Brothersons and give to it the greatest precipitation of the island. Similarly the wind tends to keep the mountain downfall away from the east side and diminish its record. For the same reason the west side has nearly as great a fall as the north, the difference being presumably due to the fact that the mountains descend to the southeast of Mount Misery. It is to be noted that the brief record of four months at the Fountain estate, only 800 feet, shows a precipitation twice as great as at Bassetere; also, that the visitor to the summit found the same mist cap there (Table 5) which so impressed me on all these inner islands.

The table of comparative rainfall on four Leeward Islands, on page 488, might convey the idea that Antigua, Nevis, and St. Kitts receive about the same amount of rain. It is my belief that in quantity of water received by the square mile, they are very different. The plants appear to show this. A heavy precipitation on the mountains must of course go to maintain the ground water of the coastal plains and make possible a cultivation that would be difficult without it. The possession of the coastal plain in which St. Kitts differs from Montserrat, Dominica, etc., may give it the advantage for human dwelling of lesser humidity. A complete account of any climate would include necessarily measures of vegetable transpiration, direct evaporation and ground water; and (lacking measures) general statements about plant life may be important qualifiers of rainfall figures.

On reference to Mr. Alexander's note on the great flood of January, 1880, in the REVIEW for May, 1899, I note that although the observers impute the flood to a fall of 20 to 36 inches (estimated) of rain, the authorities who built the wall, like those who constructed torrent pavements and bridges, looked to heavy precipitation on the mountains for their danger.

Hellmann's studies on rainfall measurements about Berlin are suggestive of limits to the dependence to be placed on the St. Kitts gages, yet, the simple prevalence of an easterly wind laden with moisture from the ocean explains admirably the results observed. As the hills east of Basseterre are low, we may group the south and east side as being to windward of low and high mountains, respectively, while the west and north

sides lie in their lee. Ascensional expansion of the air causes cooling and precipitation; the latter which is somewhat greater to leeward than to windward of the crests and greatest beside the greatest altitude, so that the amounts collected fall in the order named. Were the wind always in the east, however, there would seem to be no reason to expect the high windward (east) side to have a smaller precipitation than the low leeward (west) side. The occasional northeast wind, however, makes the east side windward of the west side's ridge.

Perhaps the rains of 1898 that gave a record of 115 inches at Brothersons were accompanied by unusually high winds.

MONTHLY STATEMENT OF AVERAGE WEATHER CONDITIONS FOR FEBRUARY.

By Prof. E. B. GARRIOTT.

The following statements are based on average weather conditions for February, as determined by long series of observations. As the weather of any given February does not conform strictly to the average conditions, the statements can not be considered as forecasts:

February is one of the stormiest months of the year along the transatlantic steamer tracks of the North Atlantic. The storms begin with east to south gales, which, in the case of westward bound steamers, quickly shift to westerly. Ice is rarely encountered as far south as the steamer routes in February, and fog is not frequent over and near the Banks of Newfoundland. In the tropical regions of the Atlantic storms seldom appear in February. On the north coast of western Cuba, however, and over the Gulf of Mexico high north winds, with decided falls in temperature, are not uncommon in February.

In the Atlantic coast districts and the Lake region of the United States the severer storms of February come from the middle-west and southwest. Well-marked storms of this type begin with high northeast winds and snow, and as they progress the wind shifts to west and northwest, with a cold wave. On the Great Plains and in the Rocky Mountain and Plateau districts February weather is usually dry and cold. As during January, however, this entire region is subject to occasional cold waves of great severity, which, with snow and high winds, sweep southward from the British Possessions in the northwest, and sometimes reach the Rio Grande and northern Mexico.

In the Pacific coast districts of the United States the season of rains and occasional strong gales continues through February.

Frost is liable to occur in any part of the United States in February. In the Gulf coast districts and in central and northern Florida the likelihood of severe freezes in February is less than for the preceding month.

THE RELATION BETWEEN THE LEVEL OF GREAT SALT LAKE AND THE RAINFALL.

By SIMON F. MACKIE, dated Salt Lake City, February 20, 1901.

The changes of level during past ages in the lake, whose remnants are known as Great Salt Lake, are matters that have been much studied from a geological point of view. The present paper relates to those changes which have occurred within a recent period and their relation to meteorology.

The drainage basin of this lake, shown in fig. 1, has an area of about fifty-four thousand square miles. How much water enters the lake from, by far, the larger portion of this area, is problematical, for all its visible affluents rise in the Wasatch or Uintah mountains. These affluents are few in number. The Jordan, Weber, and Bear are good sized rivers; Farmington Creek is a small stream; and besides these there are only a few streams from springs near the shores of the lake.

The annual evaporation from a free water surface in this vicinity is placed at about 8 feet per annum. This evaporation takes place from the whole surface of the drainage basin, as well as from the surface of the lake itself, although of course the evaporation from the soil is less than from the lake. Doubtless the rainfall in the mountains is larger than in the valleys; but, other things being equal, the evaporation is also greater. The evaporation from snow or ice is evaporation from a free water surface, as distinguished from soil, and much of the winter snowfall evaporates without melting, so that additional precipitation in the mountains is offset by additional losses.

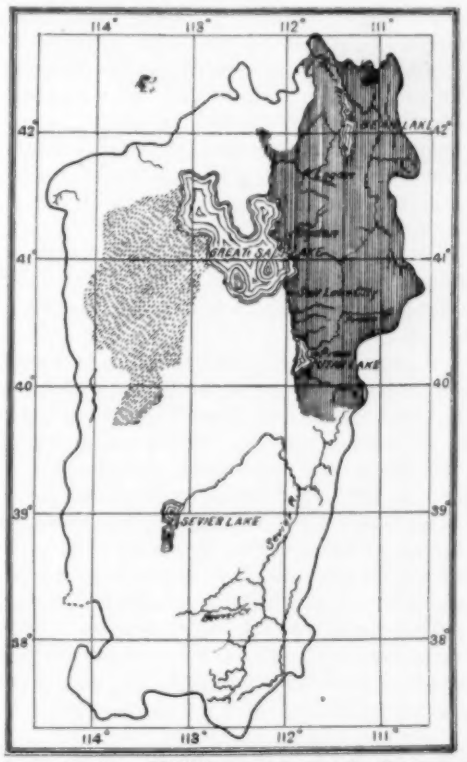

FIG. 1.—Drainage basin. Visible water supply, heavy shading; wet soil in light shading.

The actual drainage basin from which Great Salt Lake receives its visible supply of water is shown by the dotted line in fig. 1. Assuming an available rainfall of 16 inches per annum, it would require an area six times as large as the lake to supply its annual loss by evaporation. But if the visible drainage basin is apparently too small to supply the loss by evaporation, it would possibly be a mistake to suppose that no part of the supply comes from other portions. West of Great Salt Lake there is a tract of country considerably larger than the lake, in which the level of the underground water is, for practical purposes, always at the surface of the soil. This tract, if it is remembered rightly, slopes upward from the shores of the lake, until, at its western limit, it is about 100 feet higher. To the southwest Sevier Lake represents the lowest point of a drainage basin of large extent. Sevier Lake is higher than Great Salt Lake, and from it a tongue of wet soil extends northerly. So far as known, no attempt to map these wet lands has hitherto been made, and in fig. 1 is shown what is believed to be their probable boundary. The problem of the actual sources of the water supply of Great Salt Lake is therefore complex, especially as the wet area to the west receives the drainage of but one or two small mountain streams.

The changes in the volume of water in Great Salt Lake, within the period in which it has been known, are great.

The present average depth of this lake is placed at 13 feet. Within a period of fifty years it has been as low as it is now, and it has also been 13 feet higher. The shores are flat, and any rise is accompanied by a considerable increase of area; so that the present volume of water in the lake is probably less than fifty per cent of what it was in 1869.

The Mormons settled in Salt Lake Valley in 1847 and at once commenced to resort to irrigation for farming purposes. In 1848 5,153 acres were irrigated, and from that time until now the area has increased. At present all the waters of the affluents of Great Salt Lake are, as far as possible, diverted for purposes of irrigation. The following will serve as an example, showing how far this diversion of water for irrigation has been pushed. South of Great Salt Lake lies Utah Lake which empties into it through the Jordan River. The Provo River, which rises in the Uintah Mountains, is the principal affluent of Utah Lake. All the waters of the Provo River are more than once diverted, in Utah County, for irrigating purposes. All the waters of the Jordan River are diverted into various irrigating canals shortly after it leaves Utah Lake, and all the seepage water in this river is again diverted lower down more than once. Of course, the diversions mentioned only occur during the irrigating season; but, in addition to all this, it is attempted to impound the water flowing into Utah Lake in the winter and spring for use during the following summer.

This use of water for irrigating purposes, great though it is, cannot, however, be regarded as having the dominant influence on the level of Great Salt Lake. A diagram of the levels of this lake since 1850 is shown in fig. 2. During the thirty years between 1850 and 1880 larger and larger quantities of land were irrigated, more and more water was used, yet despite this large and continually increasing drain, the volume of the water in the lake doubled itself. It would be absurd, therefore, to assume that the diversion of its visible affluent waters is the dominant cause of the fluctuation in the level of Great Salt Lake, and this conclusion becomes stronger when it is recalled that lands when first irrigated require more water than later, so that, with a limited supply of water, the area of the irrigable land keeps increasing.

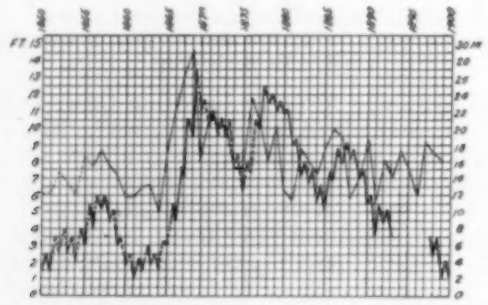

FIG. 2.—Rainfall (light lines) and lake levels (heavy lines).

If the use of water for irrigating purposes cannot, *per se*, account for all the changes of level, then it will hardly be questioned that the rise and fall of Great Salt Lake is the concrete resultant of complex climatic forces, whose study from this point of view is important.

A comparison between the level of Great Salt Lake and the annual precipitation in Salt Lake Valley has been made, with the result shown in fig. 2. In reference to this comparison it has been said, by those adducing it, "there is a general agreement between precipitation and the lake variation," and this may well be regarded as a favorable summing up. It requires, however, but little consideration to see that this comparison is hasty and illogical in principle.

Assume that all the precipitation were collected in a rain gage in which it could accumulate for an indefinite period, without sustaining any loss whatever, and that by means of a pencil, moved by a float in this gage, an automatic record of the precipitation were kept on a continuously moving sheet of paper, and consider the nature of the trace on the paper thus obtained. Below is given the rainfall in Salt Lake City from the observations taken by the United States Weather Bureau during the month of November, 1900:

Date.	Precipitation, in inches.	Date.	Precipitation, in inches.	Date.	Precipitation, in inches.
Nov. 1...	0.12	Nov. 11..	0.00	Nov. 21..	0.15
Nov. 2...	0.00	Nov. 12..	0.00	Nov. 22..	0.01
Nov. 3...	0.00	Nov. 13..	0.00	Nov. 24..	0.17
Nov. 4...	0.00	Nov. 14..	0.00	Nov. 24..	0.00
Nov. 5...	0.00	Nov. 15..	0.00	Nov. 25..	0.00
Nov. 6...	0.00	Nov. 16.	0.00	Nov. 26..	0.00
Nov. 7...	0.00	Nov. 17..	0.55	Nov. 27..	Trace.
Nov. 8...	0 00	Nov. 18..	0.12	Nov. 28..	0.00
Nov. 9...	0.00	Nov. 19..	0.21	Nov. 29..	0.00
Nov. 10..	0.00	Nov. 20..	0.07	Nov. 30..	0.00

Fig. 3 shows an approximation to what would have been the pencil trace if an automatic record like that referred to had been kept.

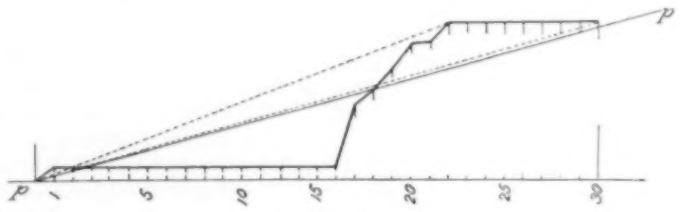

FIG. 3.

Referring to fig. 3 it will be seen that when there is no precipitation this trace is a horizontal line, while as soon as it begins to rain this line commences to rise, and continues rising so long as it rains. It has *ex necessitate*, been assumed that the precipitation was uniform throughout the whole period in which it is reported to have occurred. This assumption is inaccurate, an absolutely correct representation requiring that the ascending straight lines in fig. 3 be replaced by more or less complex curves; but the error thus introduced does not affect the general idea of the form of such a quasi automatic pencil trace, or the conclusions to be drawn from it. This quasi automatic trace is evidently an automatic integration, the ordinates to the curve, giving the total rainfall from the commencement of the record to the date of the corresponding ordinate. If, therefore, it be desired to show upon such a quasi automatic record the position of a line representing the mean precipitation for any period, all that is necessary is simply to draw a straight line from the origin through the summit of the terminal ordinate of the period for which the average is desired.

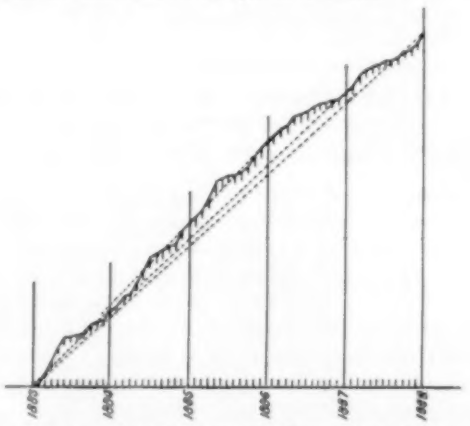

FIG. 4.—Rainfall during November, 1900.

Considering the position of these lines of average precipitation, reference to fig. 4, which gives an approximate diagram

of the rainfall at Salt Lake City, for a few years, constructed upon the assumption that the precipitation in any month occurred uniformly throughout that period (but otherwise similar to fig 3) shows that they oscillate about the true position of the line of mean precipitation, according to whether the terminal period is wetter or drier than the true average, rising above it if wetter, falling below it if drier. The amplitude of these oscillations will diminish as the period of observation lengthens, but the oscillation does not vanish until the period of observation becomes infinite, and even a close approximate to the true mean precipitation can only be obtained after long-continued observations. Very possibly the finding of a close approximation to the mean precipitation might be facilitated by a resort to the mathematical theory of probabilities; but this is a question foreign to present purposes.

Reverting to the automatic trace previously described, compare it with what was done in preparing the rainfall line in fig. 2. In the first place, the continued process of mechanical integration, accomplished by the hypothetical automatic record is from time to time arbitrarily interrupted; in other words, the rainfall from one first of January to the next is added up, the total stated as the precipitation for the year, and then the slate wiped off and a new addition commenced. A graphical representation of what is actually done is shown in fig. 5, which is constructed from fig. 4, by simply making the initial ordinate at the first of each year zero. It is evident that fig. 5 represents correctly no natural phenomenon. Nature does not balance its books on the first of January, or stop work and take a fresh start. But fig. 6, which is prepared from fig. 5 by simply connecting the summits of the last ordinates of the different years, represents what is done to obtain the rainfall line in fig. 2. That this line represents no natural phenomenon is clear. It might be useful for conveying an idea, but a comparison of figs. 4, 5, and 6 shows that the idea which is conveyed is erroneous; hence, the comparison, attempted to be made in fig. 2 is hasty and illogical.

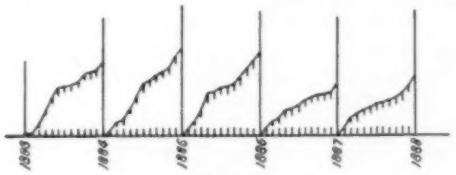

FIG. 5.

As any comparison of things which are incomparable must usually lead to erroneous conclusions, and as the comparison of a continuous record with a discontinuous one, without eliminating the element of discontinuity is fallacious in principle, hence, as an essential preliminary to a comparison between the level of Great Salt Lake and the precipitation, it is necessary to obtain some record of the rainfall which shall be continuous.

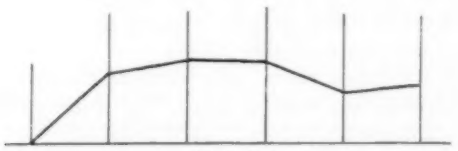

FIG. 6.

The quasi automatic record previously suggested is probably utterly impracticable; a rain gage could not be constructed in which no losses would occur for an indefinite period, and even if this practical difficulty were overcome there are the insuperable theoretical obstacles, that the rain gage must be indefinitely large and the recording sheet infinitely wide. These last considerations are those which from this point of view require the records of the rainfall to be kept as they now are. But whatever might be the practical difficulties which would arise in actual construction, it is perfectly possible to devise an apparatus that will entirely avoid the theoretical difficulties mentioned, and keep automatically a continuous record of the rainfall. If it be assumed that from the rain gage there is continuously allowed to escape a quantity of water equal to the mean precipitation, then the size of the rain gage required to hold all the rainfall for an infinite period becomes finite and comparatively small, and the trace made by the moving pencil operated by a float in such a gage would be contained within the limits of a sheet of paper of finite and moderate width, and a continuous record without breaks in its continuity could be kept.

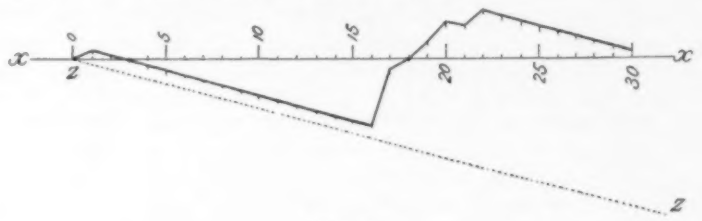

FIG. 7.

An approximation to such a record, prepared from the same data as were used in making fig. 3, is shown in fig. 7. The great difference between these two diagrams is that the lines which are horizontal in fig. 3 incline downward in fig. 7, while those which incline upward in fig. 3 are flatter or even incline downward in fig. 7. The reason is obvious; during the whole period the escape of the water representing the mean precipitation from the hypothetical rain gage imparts to the float in it a downward movement, which is partially or wholly counteracted or even reversed as soon as the rainfall enters the gage. The base line or axis of x, in fig. 7, represents the line of mean precipitation, p p, in fig. 3, and the ordinates in fig. 7 are the distances from the line of mean precipitation to the quasi trace in fig. 3. The quasi trace in the hypothetical automatic record in fig. 7 may evidently rise above or fall below the axis of x. If the rainfall exceed the mean precipitation, the trace will rise above the axis of x, while if the reverse be true, it will fall below it; and if the average precipitation during the entire period under consideration is equal to the mean or normal precipitation, the last ordinate for that period will be equal to the first. In making such a diagram as shown in fig. 7 it will usually be convenient to take the ordinate of the quasi trace at the origin of coordinates, as zero, because the true position of the line of mean or normal precipitation is as yet unknown. The line of mean or normal precipitation in such a diagram will be parallel to the axis of x, and its most probable true position will be that which makes the sum of the deviations of the trace above it equal to the sum of the deviations below it, so that it has a symmetrical relation to the quasi trace. Further, if through any point of the quasi trace a straight line, z z, be drawn, making with the axis of x an angle which corresponds to the mean precipitation, then the vertical distances from this line to the quasi trace give the total precipitation for the corresponding dates. In this case, as in the preceding one, the quasi trace represents an integration, and the length of the ordinate at the end of each interval can be obtained numerically by subtracting from the total precipitation for that interval the corresponding mean precipitation and adding the difference to the initial ordinate, both addition and subtraction being, of course, algebraic.

An approximate diagram of such a quasi trace, prepared from the observations made by the United States Weather Bureau at Salt Lake City, given in the following table, is shown in the upper full curve, A, of fig. 8:

In this diagram the precipitation which fell during each month is regarded as having fallen uniformly throughout

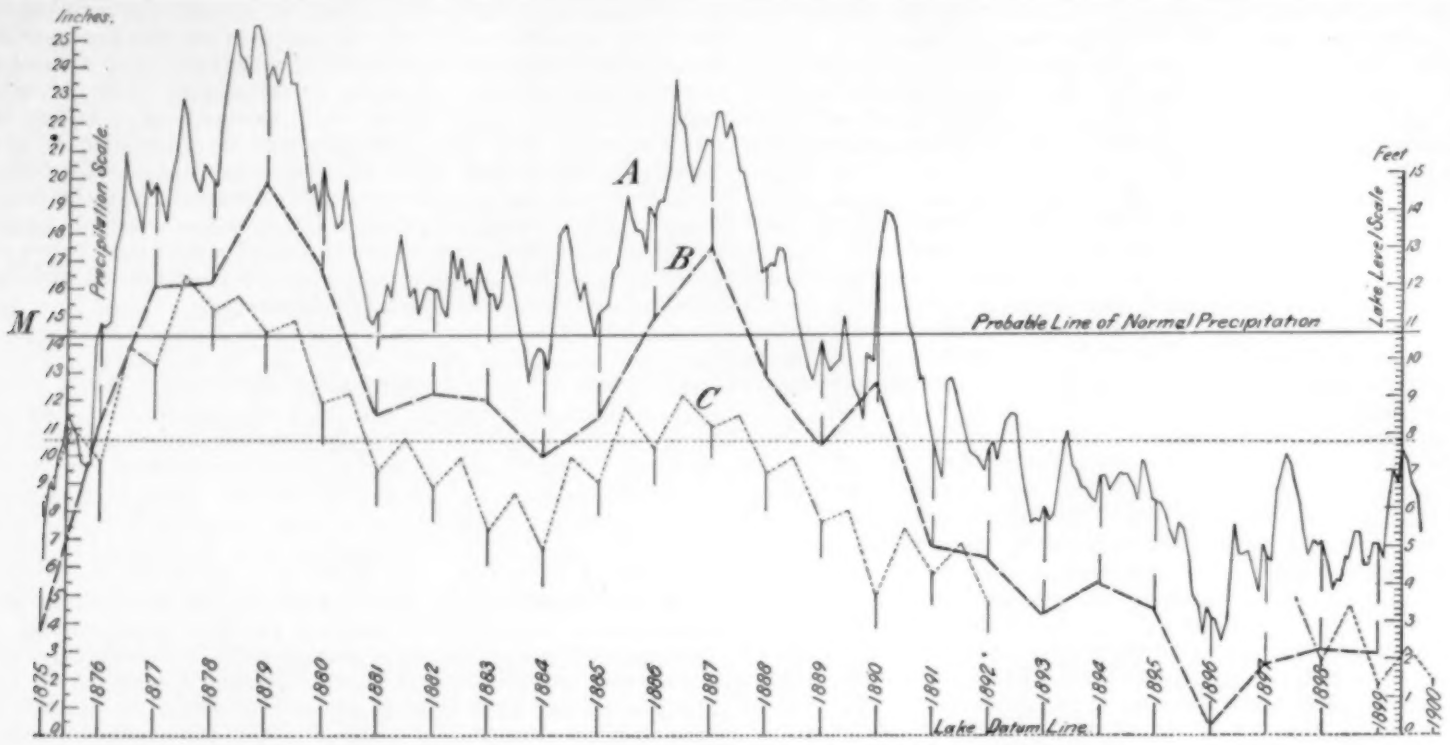

FIG. 8.

the entire month, an assumption required by the scale of the diagram. The normal precipitation is for convenience taken throughout as 1.35 inch per month, or 16.2 inches per annum.

Monthly and annual precipitation, Salt Lake City, Utah, from 1874 *to* 1899, *in inches.*

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1874	.....	.....	1.31[a]	.90	2.84	.74	2.42	1.63	.20	1.74	2.16	.73	14.67
1875	3.05	.79	2.81	1.50	2.91	.90	1.01	.25	1.22	1.36	5.81	2.03	23.64
1876	1.38	1.52	4.00	2.09	4.30	.09	.83	.92	.42	3.27	.81	1.80	21.28
1877	.87	.38	2.93	2.14	3.49	.80	.02	.28	.90	2.41	1.02	1.11	16.35
1878	1.07	3.49	2.84	2.63	2.50	.35	1.08	.81	3.15	1.89	.63	.11	19.75
1879	1.87	.71	.67	3.26	.10	1.34	.07	.06	.01	1.62	.32	3.08	13.11
1880	.29	1.02	.43	2.37	1.85	.01	.20	.74	.56	.40	1.17	1.90	10.94
1881	1.24	2.44	.88	2.37	2.55	.28	.21	1.66	.43	2.19	1.44	1.24	16.93
1882	1.50	.42	1.12	3.81	.26	2.24	.30	1.61	.37	2.89	.54	.92	15.98
1883	1.47	.72	1.75	2.92	.98	.33	.10	.02	.18	2.24	1.78	1.30	14.24
1884	.71	2.33	3.69	2.89	1.78	.33	.27	.73	1.91	.36	.50	2.12	17.52
1885	1.48	1.56	.64	3.47[b]	2.49	2.67	.58	.90	1.29	.59	3.10	.92	19.69
1886	1.91	1.36	2.60	4.42	.06	1.02	T.	.59	1.88	1.98	1.79	1.27	18.89
1887	2.36	1.41	.35	1.87	.73	.37	1.23	.69	.55	.30	.25	1.55	11.66
1888	1.52	1.22	2.18	.99	.84	.36	.24	.63	.51	.80	2.00	2.21	13.62
1889	.73	.81	1.64	1.52	2.97	.01	.08	.92	.52	3.85	1.04	4.37	18.46
1890	3.07	2.05	1.12	.94	.16	.32	.02	.79	T.	1.44	T.	.42	10.33
1891	.74	.76	4.66	1.49	.72	1.08	.47	.46	1.19	1.26	.90	2.19	15.92
1892	1.61	.68	2.21	1.90	1.65	1.21	T.	.05	1.12	1.58	.72	2.35	14.08
1893	.82	1.64	2.68	2.72	1.68	.04	1.19	.71	1.30	1.02	1.18	2.37	17.35
1894	1.31	.53	1.73	1.67	1.22	1.38	0.82	.87	2.87	1.01	.28	1.28	15.27
1895	1.32	.85	.81	.73	2.29	.99	.42	.02	.95	.24	2.44	.89	11.95
1896	1.26	.69	1.99	2.53	3.67	.25	1.35	1.47	.52	.70	3.15	.84	18.42
1897	1.16	3.81	2.30	2.00	.98	.52	.69	.33	.48	1.91	1.19	1.47	16.74
1898	.58	.38	1.71	1.30	4.19	1.45	.18	1.35	.15	1.57	1.95	1.28	16.09
1899	.84	2.98	2.93	.81	2.59	.96	.42	1.06	T.	.....	.....	.....	12.59
Sums	34.01	34.75	51.58	55.25	49.30	20.66	14.20	20.15	21.63	38.12	36.17	39.65	402.88
Averages	1.36	1.39	1.98	2.12	1.90	.79	.55	.78	.83	1.52	1.45	1.59	16.18

[a] 12 days. [b] 28 days. T. indicates trace.

The line, *M*, gives the approximate position of the line of normal precipitation for the period of observation. It is very evident, however, that the correct determination of even an approximately true position of this line requires data covering a longer period than the observations afford.

There is no reason to suppose that the quasi trace, *A*, shown in fig. 8 is exceptional in character, and its general resemblance to a compound wave curve is obvious. Of course, a trace plotted on a larger scale, when the daily precipitation could be plotted, would show even greater deviations from a simple curve. This, however, does not detract from the evident suggestion that the natural forces operative are essentially periodic in their nature. This has long been suggested, and it is apparent that a graphic representation like that under consideration enables such forces, if they in fact exist, to be conveniently studied.

The effect of assumptions made in platting is indicated in fig. 8, which shows two different plattings of the same phenomena. The upper line in this diagram is the quasi trace; the lower or heavy dash line, *B*, is for the same period, but in it it is assumed that the rainfall in any one year is uniformly distributed throughout the year. The lack of character and essential detail in the lower line is very apparent, and it is evident that, if correct impressions are to be obtained, this detail is important. It is obvious that a diagram that shows the diurnal or even the hourly precipitation would be preferable to either of those under consideration.

The lower or dotted line in fig. 8, *C*, shows the level of Great Salt Lake platted from the data given in fig. 2. The general parallelism of lines *A* and *E* is apparent, and while the arbitrary scale for plotting the lake level was selected with a view to showing the general similarity to the best advantage, a comparison of fig. 8 with fig. 2 shows that this general correspondence actually exists.

The level of Great Salt Lake depends upon the precipitation and evaporation taking place throughout the whole extent of its drainage basin. Precipitation and evaporation are counteracting. Evaporation is certainly not a constant quantity, and possibly no more constant than precipitation The precipitation at Salt Lake City does not accurately represent that which occurs throughout the entire basin. The showers and storms throughout this area are frequently local in their character. Then while the diversion of the waters of the affluents of the lake for irrigation can not be regarded as the dominant factor which determines its level, it is a factor which may and probably does have some, possibly a considerable, effect on the lake level. Further, both the lines *A*, and *C*, in fig. 8, are approximations, and absolutely correct dia-

grams might give somewhat different results. There may be other operative causes than those just mentioned, but these are apparently sufficient to explain why a divergence between the two lines (possibly a greater divergence than that found) might be expected.

A deduction, that evidently might be drawn from the general parallelism of these lines, is that the factor of the rainfall, approximately shown in fig. 8, is of great, possibly dominating climatic importance. It is true that such deduction might prove to be erroneous and the parallelism be a mere accidental coincidence. This is a question, which can only be solved by further observation, and, pending such crucial test, the force of the obvious suggestion remains. Another obvious inference, deducible from the general parallelism of these lines, is that the fluctuations of the level of the lake, in the past, indicate similar fluctuations in this function of the precipitation. It ought from this consideration to be inferred that among the operative forces, if periodic, there are some of very long period, apparently longer than half a century, which have considerable effect.

That the fluctuations in the level of Great Salt Lake would, to some extent, affect the condition of the surrounding country might, for *a priori* reasons, be expected. The fall of the lake would lower the drainage level, and thus reduce the height of the underground water and the saline contents of the soil. The fact seems to be that since the country was settled in 1847 the character of the vegetation in the lands west of Salt Lake City has changed, the grasses being replaced by greasewood and other salt resisting plants. Doubtless, the present condition of these lands is unnatural and much affected by the acts of man. Overpasturing, canal seepage, and excessive irrigation, have all contributed their part toward producing the present condition. This, however, does not touch the fact that when the valley was settled the waters of the lake were low, that they rose steadily for more than a quarter of a century, and have since been receding. The total rise and fall being about thirteen feet or more. Nor does it affect the facts that these lands were less saline, when the country was settled, that their salinity as indicated by the vegetation increased before there was any irrigation, and that of late years their character has much improved. These salient facts are entirely independent of the acts of man. It is unfortunate that slow natural changes, like those under consideration, are difficult tc appreciate. After a series of years the observer may indeed notice an apparent change, but in the absence of full notes of prior observations recourse must necessarily be had to more or less uncertain recollections, perchance tinctured by preconceived opinions; so that the conclusions must always be unsatisfactory. That these changes might all be explained by the rise and fall of the lake is obvious, but it must be remembered that the lands referred to are not those immediately adjacent to it, but were at least four or five miles distant from its shores when it was highest, and that their surface was, at that time, several feet above the lake.

When it is said that the level of the underground water would be raised by a rise in the waters of Great Salt Lake and lowered by their fall only one factor of the change which takes place has been considered. If the level of the lake remained the same those natural forces which produce the fluctuation in its level would change the gradient of the underground water, for this gradient depends upon an equilibrium of supply and discharge, as controlled by frictional resistances, and any increase in the supply or discharge changes the gradient. The movement of water in soils is not a simple, but a dual phenomenon. If the soil is not surcharged with water, the movement results from the capillary forces explained by Mr. Briggs in his paper on the Movement and Retention of Water in Soils, published in the Year Book of the Department of Agriculture for 1898; but when, on the other hand, the soil is surcharged with water under pressure, its movements are controlled largely, if not wholly, by frictional resistances. These frictional resistances are functions of the pressure or head, which vary with the pressure, and the movements of the water are asymptotic in character. To illustrate their character, assume a water-tight vessel to be divided into two parts by a porous partition resembling a thin sheet of sand or clay, and that one of the parts is filled with water, which percolates through the partition into the other; then since the flow of water depends upon the head and decreases as the head diminishes, vanishing only when the head becomes zero, it follows that if no other force were operative it would take an infinite period before the water on both sides of the partition stood at the same level. Practically if the partition were very thin, a sensible agreement of level might result in a comparatively short space of time; but as from the increased frictional resistance the flow decreases very rapidly as the thickness of the partition increases, it requires very long periods of time with a thick partition to reduce the gradient of the flow to even sensible horizontality. For this reason the underground waters usually have high gradients.

In wet seasons the quantity of underground water to be discharged will be increased and in dry diminished, and the gradient flatten or steepen; but since from the slowness of the discharge it cannot be assumed that all the increase of the underground water in any one year, even when the level of the outlet remains constant, is discharged during that year, it is probable that a succession of wet or dry years causes the level of the underground waters, even when the point of discharge remains the same, to fluctuate as does the level of Great Salt Lake.

When the soil is not surcharged with water under pressure and the movement of the soil water depends upon capillary forces, the same results would apparently follow, for these are relatively weak forces.

Assuming that at a certain depth below the surface the moisture in the soil remains constant, while above it the soil is wet by precipitation and dried by evaporation; then there is apparently no reason why the level of normal soil moisture should remain constant. If wet years were succeeded by wet years, this level should rise, and if dry years followed dry years it should fall, just as the level of Great Salt Lake does, these oscillations of level being largely influenced by the accumulated deviation from the mean precipitation.

If the level of this normal soil moisture has, as it might well have, some influence on vegetation, then it is apparent that it becomes a climatic feature of some importance.

These *a priori* conclusions can of course merely establish probabilities, which may or may not be verified by observation and experiment, and they are only valuable as indicating along what lines observation and experiment might be made, in the hope of obtaining important results. Obviously, if it be conceded that the fluctuations of the level of Great Salt Lake are typical of climatic conditions which may prevail everywhere to a greater or less extent, the first step toward the study of these conditions would be the tabulation of the departures of the total precipitations from the mean or normal precipitation.

FOG STUDIES ON MOUNT TAMALPAIS: NUMBER 5—WRECK OF THE PACIFIC MAIL STEAMSHIP RIO DE JANEIRO.[1]

By ALEXANDER G. MCADIE, Forecast Official.

On the morning of Friday, February 22, 1901, the Pacific

[1] The publication of No. 4 is delayed by nonarrival of half-tone plates. It may be expected in the March REVIEW.—ED.

Mail steamship *Rio de Janeiro* ran upon the Fort Point Reef during the fog. Within fifteen or twenty minutes from the time of striking the vessel sank, and of the 210 persons on board, 130 were lost. Another statement, purporting to be official, makes the total number aboard 207 and the lost 127.

The following facts are obtained chiefly from the statements of Pilot F. W. Jordan; the ship's master, Capt. William Ward, went down with the vessel. The pilot boarded the *Rio de Janeiro* in the vicinity of the 9-fathom buoy, near the bar buoy, and anchored in 13 fathoms at a little before six o'clock Thursday night, February 21. The weather being foggy, the ship remained at anchor till about 4 a. m., one hundred and twentieth meridian time, when the fog lifted and the Cliff House light could be seen, but not the Point Bonita light. Preparations were in progress to steam into the harbor, when a dense fog came out from the Golden Gate, obscuring everything. There is some difference of testimony as to whether the captain or the pilot gave the orders to proceed in the fog, but the vessel was started on a northeast course with Lime Point straight ahead, steering by the whistle. The pilot expected to get an echo of the ship's whistle from Point Diablo, but heard none. The course was changed north-northeast with the intention of running close to Lime Point. The vessel was not moving at full speed and was subject to a strong cross current, which, apparently acting at right angles to the length of the vessel, carried the ship to the south, far out of the proper course. The first officer was standing on the starboard side listening for the Fort Point bell. No soundings, however, were taken. The vessel struck a short distance to the southwest of the Fort Point light. At the moment of striking the pilot saw the white flash at Fort Point and heard the Fort Point bell.

The pilot had had eleven years' experience in the harbor and was considered one of the most capable pilots in San Francisco. He had never previously met with an accident. There appears to be no doubt of the existence of the strong cross current, inasmuch as other vessels entering the harbor about the same time on the same morning came near going on the rocks. The Pacific Mail Steamship Company has a rule that vessels must not enter or leave a harbor when fog prevails. On the morning in question the fog lifted for a few moments and then settled down again; but by 9 a. m., local time, the fog had dissipated. The rest of the day was clear and balmy and the water as smooth as a mill pond.

The vessel struck about 5:30 a. m., with the pilot and captain on the bridge, the first officer on the starboard side of the bridge listening for the bell, and the second officer at the telegraph. When the vessel struck the captain blew the danger whistle, a long blast. Ordinary fog blasts (long enough to count six or seven) had been blown previously.

The details of the accident, particularly with reference to the whistles, the course steered, and the motion of the current are given, because from such evidence as can be obtained at this writing, it appears that even after the vessel struck the sound of the whistle was not heard plainly at Fort Point not more than half a mile distant, where a lookout of the life-saving station was on duty, and where a life-saving crew could have hurried to the rescue and probably reached the ship within five minutes, without doubt saving many of those whose lives were lost. There was also a sentry walking post within a short distance of the lookout. It is stated that some soldiers heard voices and also a whistle, but the evidence is very conflicting and it seems improbable that if the long danger blast was clearly heard it should pass without notice and subsequent action.

The Weather Bureau records show that about the time of the accident a mongrel tule fog prevailed over the Bay of San Francisco. At Mount Tamalpais the weather was clear with a wind of 13 miles per hour from the northwest. At San Francisco dense fog prevailed with little if any wind. The wind vane at the Mills Building indicated a southwest wind blowing about one mile per hour. From 1 a. m. till 6 a. m. but 9 miles of wind were recorded.

When all is said and done, it appears that the fog was the prime factor in causing the loss of the vessel. Owing to the aberration of the sound waves in the fog, the pilot was unable to hear the fog signals from either Point Bonita or Lime Point to the north, or the tolling of the bell at Fort Point to the east and north. It has not, however, been shown that the bell was certainly ringing. The Lime Point whistle has great penetrative power. The fog bell at Fort Point is 40 feet above the water and should be heard for at least a mile. It is supposed to be struck every ten seconds. It is a strange fact that in a paper upon the Fogs and Fogs Signals of the Pacific Coast, by Ferdinand Lee Clark, published in 1888, there should occur this statement concerning the fog bell at Fort Point—

> In point of fact it is said to be hardly ever heard except when too late to be of use. * * * If mariners depended upon its sound to tell them how near they were to the point they would generally have no time after hearing it to clear the danger.

The loss of the *Rio de Janeiro* proves that the bell at Fort Point in its present position is sometimes of little value.

The temperature at the time of the accident was 50° F. at sea level, and 52° at a height of 2,500 feet. The thickness of the fog probably did not exceed a few hundred feet; and as indicated above it was a land fog rather than a sea fog.

As a general thing the reflected sounds from Point Bonita and Lime Point are heard better on the south side of the channel. On the accompanying rough sketch of the channel the lines of natural reflection are drawn and also the zones of inaudibility.

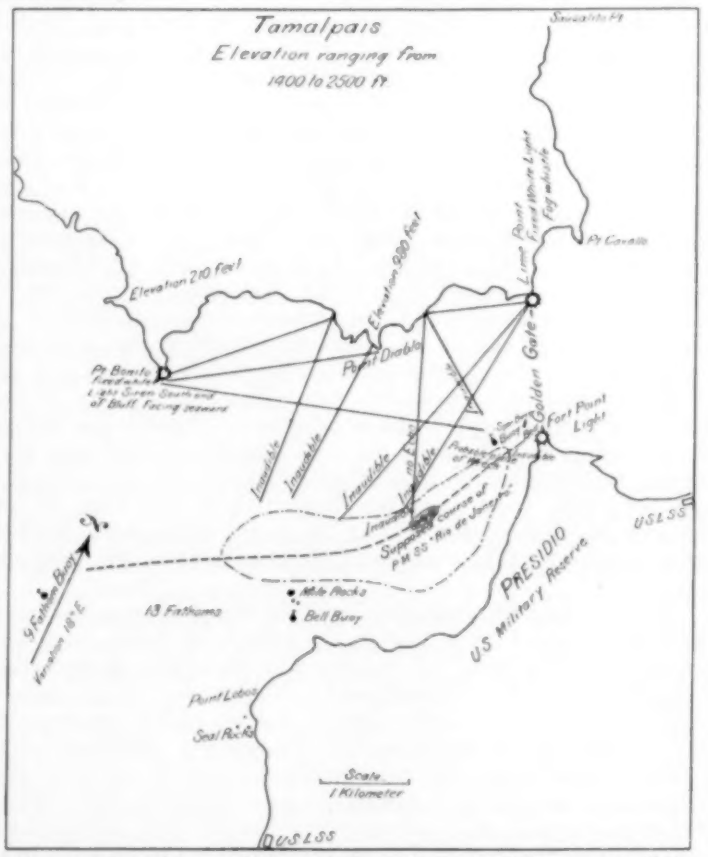

FIG. 9.—Probable conditions at time of wreck, February 22, 1901.

It is not difficult to account for the failure of the echo of the ship's whistle from some portion of the northern shore, as the distance of the vessel from Point Diablo was too great.

The sound waves from the fog whistle at Lime Point, however, should have been heard, and as the moderate southwest wind would tend to cause a deflection of the sound wave upward, it is possible that while the sound was inaudible on the deck of the vessel, it might have been heard by a lookout at the masthead.

The catastrophe furnishes a remarkable illustration of the utter helplessness of a vessel in fog despite lights and fog whistles. It would seem that under such conditions nothing short of some method of fog dissipation will suffice.

It has occurred to the writer, although the suggestion may prove of no value in practice, that if a strong sound had been made under water by some automatic contrivance at either Lime Point or Point Diablo, and the *Rio de Janeiro* been provided with some suitable device rendering audible the sound wave through the water, the strong cross current would have facilitated the passage of the sound, and a zone of audibility would have been established in the water while in the atmosphere above the fog signals would have been inaudible.

The accompanying photographs, Plate I, are submitted to show that to a certain degree the captain and the pilot were justified in assuming that they might soon run into areas free from fog. As a matter of fact on the day in question the fog soon disappeared and a delay of perhaps two hours would have prevented the accident. It should not be forgotten, however, that the captain was unwilling to enter the harbor during the fog Thursday night, and that the vessel remained at anchor for a period of nearly twelve hours, and was thereby exposed in a large degree to the danger of collision.

LAKE LADOGA FROM A THERMIC POINT OF VIEW.

By JULES DE SCHOKALSKY, St. Petersburg, Russia. Translated from Comptes Rendus, Paris, June, 1900.

Lake Ladoga occupies the first place among the bodies of fresh water in Europe; its surface is thirty-one times larger than that of Lake Leman; its length is 202 kilometers and its width attains 75 kilometers. Its cartography and hydrography have been studied by a scientific expedition which worked, with interruptions, from 1858 to 1873, under the direction of the Hydrographic Service of the Imperial Russian Navy. The expedition having more especially a hydrographic aim had not time for the study of the chemical composition of the waters of the lake nor for the thermic study of its deep strata layers. The Imperial Russian Geographical Society, at my suggestion, decided to begin these studies and, thanks to the Hydrographic Service and the Ministry of Roads and Communications, who respectively gave the instruments and the use of a small steamer, without which it would have been impossible to carry on the work, I was enabled to make two trips on the lake, both at nearly the same season of the year, during the first half of July, 1897 and 1899.

The temperatures at great depths were measured with the thermometers of Negretti and Zambra, verified as to zero point.

The relief of the bottom of the lake is such that the depth increases regularly from south to north, the greatest depths being found in the northwest portion (120 fathoms = 219 meters). Upon the chart there are two sets of broken lines, one solid, the other in dashes, which show the courses that I sailed. The stations at which the thermometric soundings were made are marked by roman numerals; in 1897 14 were made; 1899, 20; a total of 34, some of which coincide with each other, as will be seen by the chart accompanying this summary.

In 1897 the principal fact that I established was the following: At all of the stations I found that the thermal stratification was *direct*. The temperature of the surface waters and those of the lower strata, at identically the same depths were different at the south and at the north ends of the lake. At the south end in July the water at the surface was relatively warm, 13.1° C. and 11.3° C., but in proportion as we approached the north the temperature became lower; in the middle of the lake it was 10.7° C. and in the deepest part 6.8° C. At the south, the abyssal strata, in shallow water had quite a high temperature, at 10 meters, 11° C.; at the north, at the IXth station, at 45 fathoms (82 meters), I found a temperature of 4° C., and at the VIIIth station, from 50 fathoms (91 meters) to 120 fathoms (219 meters), or the bottom, the temperature remained nearly constant, 3.9° C.

One might be tempted to think that these temperatures for the surface waters and for the deep strata observed in the month of July, 1897, were already quite low for a season so near to the month of August, in which they reach their maximum for the whole year. But in 1899 I found them still lower, particularly at the northern part of the lake which is the deepest; the two stations marked on the chart show this clearly.[1]

But what was especially interesting was the fact that the thermic stratification in July, 1899, at all the deep stations in the north of the lake was distinctly *reversed*, whereas one might have expected that in Ladoga, which according to the classification of Prof. F. A. Forel, belongs to the type of temperate lakes, the inverse stratification would have come to an end at the beginning of summer.

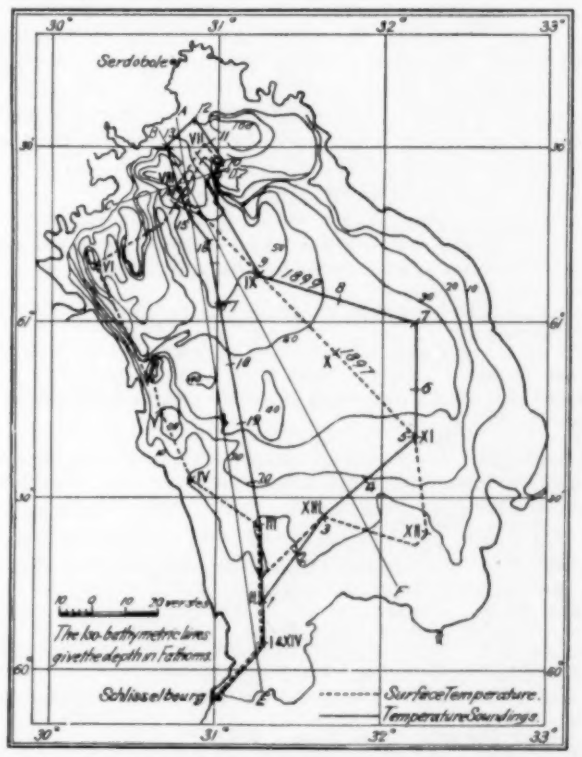

FIG. 10.—Soundings and courses on Lake Ladoga.

The divergences in the results of the two years were caused by the differences in the temperature of the air in the neighboring countries during the springs of 1897 and 1899. If we observe the temperatures of the months of April, May, and June of these two years, and if we compare them with the normals, which are given in the new Atlas Climatologique de Russie, published by the Central Physical Observatory, we shall find that the temperature of the air during these three months at seven stations distributed around the lake, was much higher than the normal in 1897 and lower in 1899. According to the Bulletin Mensuel Météorologique all the northwest portion of Russia enjoyed temperatures much

[1] The scale of the published chart is too small to show all these stations.—ED.

higher than the normal in 1897; the deviations in the month of May reached 8° to 11° C. at St. Petersburg; the monthly mean being the highest that had been observed in one hundred and fifty years; it was the same case at Archangel, according to a series of observations for eighty years. On the other hand, the spring and the beginning of the summer of 1899 were, in the northwest portions of Russia, much colder than usual; in the month of May there were days having a deviation of from 5° to 8° C., and the temperature was below the normal during twenty-one *consecutive* days.

From these results it may be concluded that Lake Ladoga, which undoubtedly belongs to the type of temperate lakes, according to the classification of Prof. F. A. Forel, is placed in this series very near to the line which separates this type from that of the polar lakes, which always have an inverse thermic stratification.

The stratum where the thermic fall is due to the diurnal variation of the temperature of the shallow strata is produced was lower down in 1897 than in 1899. This is well explained by the fact that in 1897 the entire mass of the water of the lake was much warmer than in 1899.

RECENT PAPERS BEARING ON METEOROLOGY.

W. F. R. PHILLIPS, in charge of Library, etc.

The subjoined list of titles has been selected from the contents of the periodicals and serials recently received in the library of the Weather Bureau. The titles selected are of papers or other communications bearing on meteorology or cognate branches of science. This is not a complete index of the meteorological contents of all the journals from which it has been compiled; it shows only the articles that appear to the compiler likely to be of particular interest in connection with the work of the Weather Bureau:

Annales de Chimie et de Physique. Paris. 7me séries. Tome 22.

Violle, J. Rapport sur la radiation, présenté au comité météorologique international, à Saint-Pétersbourg, en 1899. Pp. 329–370.

Gaea. Leipzig. 37 *Jahrg.*

Wollny, E. Ueber den Einfluss der Pflanzendecken auf die Wasserführung der Flüsse. (Schluss). Pp. 220–223.

Klein, H. J. Strenge Winter. Pp. 223–233.

Annalen der Physik. Leipzig. Vierte folge. Band 4.

Pockels, F. Zur Theorie der Niederschlagsbildung an Gebirgen. Pp. 459–480.

Himmel und Erde. Berlin. 13 *Jahrg.*

Assmann, R. Die modernen Methoden zur Erforschung der Atmosphäre mittels des Luftballons und Drachen. (Schluss folgt). Pp. 241–260.

Nature. London. Vol. 63.

—— Red Rain. Pp. 471–472.

Pellew, E. Variations of Atmospheric Electricity. P. 491.

Symon's Meteorological Magazine. London. Vol. 36.

Curtis, R. H. Pressure of the Wind. (Concluded). Pp. 17–19.

American Journal of Science. New Haven. 4th series. Vol. 11.

Penfield, S. L. Stereographic Projection and its Possibilities from a Graphical Standpoint. Pp. 1–24, 115–144.

Bigelow, Frank H. The Magnetic Theory of the Solar Corona. Pp. 253–262.

Popular Science Monthly. New York. Vol 58.

Dexter, E. G. Suicide and the Weather. Pp. 604–617.

Cochrane, C. H. Recent Progress in Aerial Navigation. Pp. 616–624.

Astrophysical Journal. Chicago. Vol. 13.

Nichols, E. F. On the Heat Radiation of Arcturus, Vega, Jupiter, and Saturn. Pp. 101–141.

Annales de Géographie. Paris. 1901.

Woeikof, A. De l'influence de l'homme sur la terre. (Premier article). P. 97–114.

Zeitschrift für Gewässerkunde. Leipzig. Band 3.

Wollny, E. Ueber den Einfluss der Pflanzendecken auf die Wasserführung der Flüsse. Pp. 345–362.

Comptes Rendus. Paris. Tome 132.

Arctowski, Henry. Sur les périodes de l'aurore australes. Pp. 651–654.

La Nature. Paris. 29me année.

Plumandon, J. R. Le tir au canon contre la grêle. Pp. 266–267.

Meteorologische Zeitschrift. Band 18. *Wien.*

Mohn, H. Einige Bemerkungen über die Schwerekorrektionen der Barometerhöhen. P. 49–53.

Woeikof, A. Platzregen und grosse tägliche Regenmengen. Pp. 53–75.

Schreiber, —. Beiträge zur Hageltheorie. Pp. 58–70.

—— Vorläufige Mittheilung über die internationale Ballonfahrt vom 8 November, 1900. P. 71.

—— Vorläufige Mittheilung über die internationale Ballonfahrt vom 10 Januar, 1901. P. 71.

Valentin, J. Temperatur-Beobachtungen der österreichischen Ballons bei der internationalen Fahrt vom 8 November, 1900. P. 72.

Hann, J. Klima der Westküste von Marokko. Mogador. P. 76.

Lachmann, G. Ueber eine merkwürdige Blitzform. P. 80.

Kassner, C. Bequeme Berechnung der Koëfficienten der Bessel'schen Formel. P. 81.

Kassner, C. Eine Analogie der irisirenden Wolken.. P. 82.

—— Resultate der meteorologischen Beobachtungen in Belle Isle (Neufundland). P. 83.

—— Zum Klima von Syra. P. 83.

—— Versuche über den Verlust der Ladung elektrischer Flüssigkeiten durch Verdämpfung. P. 84.

Elster, J. Messungen der elektrischen Zerstreuung in der freien atmosphärischen Luft an geographisch weit von einander entfernt liegenden Orten. P. 85.

Wedell-Wedellsborg, P. S. Notiz über die Ursachen der säkulären Variationen des Erdmagnetismus. P. 88.

Halm, J. Breitenvariation, Erdmagnetismus und Sonnenthätigkeit. P. 89.

Taudin-Cabot, J. J. Grüstrahlung. P. 90.

—— Zum Klima des arktischen Nordamerika. P. 90.

Mac Dowall, Al. B. Säkulare Schwankung? P. 92.

Chistoni, C. Ueber den Regenfall in Modena 1830–1896. P. 93.

Prohaska, K. Feuerkugel in Pöllau, Steiermark.

Hepites, Stefan. Ausserordentlicher Regenfall in Rumänien. P. 94.

—— Druckfehler-Berichtigungen. P. 95.

CLIMATOLOGY OF COSTA RICA.

Communicated by H. PITTIER, Director, Physical Geographic Institute.

TABLE 1.—*Hourly observations at the Observatory, San Jose de Costa Rica, during February*, 1901.

Hours.	Pressure.		Temperature.		Relative humidity.		Rainfall.		
	Observed, 1901.	Normal, 1889–1900.	Observed, 1901.	Normal, 1889–1900.	Observed, 1901.	Normal, 1889–1900.	Observed, 1901.	Normal, 1889–1900.	Duration, 1901.
	660+ *Mm.*	660+ *Mm.*	° *C.*	° *C.*	%	%	*Mm.*	*Mm.*	*Hrs.*
1 a. m	4.75	4.02	16.82	16.31	78	83	0.0	0.0	0.00
2 a. m	4.37	3.56	16.31	16.05	81	84	0.0	0.0	0.00
3 a. m	4.15	3.35	16.04	15.81	81	84	0.0	0.0	0.00
4 a. m	4.17	3.31	16.17	15.67	80	84	0.0	0.1	0.00
5 a. m	4.34	3.55	16.00	15.56	80	84	0.0	0.0	0.00
6 a. m	4.74	3.94	15.51	15.43	84	84	0.0	0.1	0.00
7 a. m	5.04	4.34	16.26	16.11	80	82	0.0	0.0	0.00
8 a. m	5.30	4.67	18.65	18.18	66	74	0.0	0.0	0.00
9 a. m	5.62	4.90	21.18	20.45	57	66	0.0	0.0	0.00
10 a. m	5.72	4.90	23.41	22.70	53	60	0.0	0.0	0.00
11 a. m	5.42	4.53	24.94	23.89	49	57	0.0	0.0	0.00
12 m	4.90	4.08	26.01	24.79	46	55	0.0	0.0	0.00
1 p. m	4.21	3.57	26.27	25.18	48	54	1.0	0.0	0.33
2 p. m	3.61	3.01	25.84	24.96	49	55	0.2	0.0	0.33
3 p. m	3.36	2.58	24.86	24.24	54	58	0.0	0.1	0.00
4 p. m	3.37	2.58	23.29	22.77	59	60	0.0	0.1	0.00
5 p. m	3.58	2.76	21.16	21.16	66	68	4.3	0.1	0.67
6 p. m	3.97	3.13	19.56	19.49	72	74	3.0	0.0	1.00
7 p. m	4.46	3.65	18.76	18.35	76	79	0.1	0.1	0.08
8 p. m	4.85	4.10	18.28	17.90	76	80	0.0	0.1	0.00
9 p. m	5.24	4.44	17.91	17.46	77	81	0.0	0.7	0.00
10 p. m	5.42	4.63	17.56	17.12	76	82	0.0	0.1	0.00
11 p. m	5.44	4.61	17.38	16.74	77	83	0.0	0.0	0.00
Midnight	5.19	4.36	16.93	16.51	79	84	0.0	0.0	0.00
Mean	664.63	663.86	19.80	19.27	69	73	.....	.....	.....
Minimum	661.70	659.35	12.30	8.20	25	.....	.....	.....	.....
Maximum	667.70	667.72	31.60	32.00	98	.....	4.3	.....	.....
Total	.....	.....	.....	.....	.....	.....	8.6	1.5	2.41

REMARKS.—The barometer is 1,169 meters above sea level. Readings are corrected for gravity, temperature, and instrumental error. The dry and wet bulb thermometers are 1.5 meters above ground and corrected for instrumental errors. The hourly readings for pressure, wet and dry bulb thermometers, are obtained by means of Richard registering instruments, checked by direct observations every three hours from 7 a. m. to 10 p. m. The hourly rainfall is as given by Hottinger's self-register, checked once a day. The standard rain gage is 1.5 meters above ground.

TABLE 2.

Time.	Sunshine.		Cloudiness observed, 1901.	Temperature of the soil at depth of—				
	Observed. 1901.	Normal, 1889–1 00.		0.15 m.	0.30 m.	0.60 m.	1.20 m.	3.00 m.
	Hours.	*Hours.*	$	°C.	°C.	°C.	°C.	°C.
7 a.m.	3.68	11.25	40	20.64	21.05	20.91	20.32	20.79
8 a.m.	20.67	22.76						
9 a.m.	20.96	22.08						
10 a.m.	19.38	21.18	40	21.14	21.10	20.94	20.34	.....
11 a.m.	20.11	21.42						
12 m.	18.55	21.21						
1 p.m.	19.75	21.29	50	21.94	21.37	20.97	20.36	.....
2 p.m.	20.31	21.82						
3 p.m.	19.92	21.45						
4 p.m.	20.05	19.12	60	22.16	21.61	21.02	20.38	.....
5 p.m.	13.98	14.56						
6 p.m.	2.67	4.27						
7 p.m.	.....	.....	60	22.04	21.64	21.10	20.43	.....
8 p.m.	.....	.....						
9 p.m.	.....	.....						
10 p.m.	.....	.....	50	21.66	21.61	21.27	20.50	.....
11 p.m.	.....	.....						
Midnight	.....	.....						
Mean	.....	.....	48	21.60	21.40	21.04	20.39	.....
Total	200 03	230.37	.....	.....	.....	.....	.....	.....

Evaporation.—During the daytime, in January, observations incomplete; in February, 90.0mm. During the nighttime, January, observations incomplete; February, 25.7mm.

Notes on earthquakes at San Jose.—February 3, 7:20 a. m., small shock, west-northwest to east-southeast; intensity, 1; duration, ±2 seconds. February 12, 10:34 a. m., light oscillation, northeast to southwest; intensity, 1; duration, ±2 seconds. February 14, 5:21 p. m., light oscillation, east to west; intensity, 1; duration, ±3 seconds. February, 16, 7:23 a. m., tremors; 7:55 a. m. and 6:52 p. m., light shock, northwest to southeast; duration, 5 seconds; intensity, 2; people ran out into the streets. February 22, 7:14 p. m., slight shock, northwest to southeast; intensity, 1; duration, ±3 seconds; 8:08 p. m., slight shock, northwest to southeast; intensity, 1; duration, ±3 seconds. February 24, 7:55 a. m., tremors. February 25, 1:30 a. m., sensible shock, west-northwest to east-southeast; intensity, 2; duration, 10 seconds. February 26, 12:15 a. m., light shock, west-northwest to east-southeast; intensity, 1; duration, ±3 seconds. February 28, — a. m., very light shock, east-northeast to west-south-west; intensity, 1; duration —.

Notes on the weather at San Jose.—Generally warm and windy, wind from northeast. Rain almost daily through the gaps in the northern cordillera, reaching San Jose on the 16th.

TABLE 3.—*Rainfall at stations in Costa Rica*, 1901.

Stations.	January.		February.	
	Amount.	No. rainy days.	Amount.	No. rainy days.
	Mm.		*Mm.*	
1. Boca Banano	265	17	98	11
2. Limon	304	19	72	9
3. Swamp Mouth	.....	.....	131	10
4. Zent	.....	.....	.....	.....
5. Gute Hoffnung	411	15	106	14
6. Siquirres	406	10	45	4
7. Guapiles	340	13	114	8
8. Sarapiqui	.....	.....	.....	.....
9. San Carlos	301	19	67	14
10. Las Lomas	521	16	131	10
11. Peralta	335	11	65	4
12. Turrialba	.....	.....	.....	.....
13. Juan Vinas	159	14	40	10
14. Santiago	.....	.....	.....	.....
15. Paraiso	.....	.....	.....	.....
16. San Rafael C.	.....	.....	.....	.....
17. Tres Rios	2	1	5	1
18. La Palma	.....	.....	.....	.....
19. S. Francisco G	7	2	9	1
20. San Jose	4	2	9	1
21. La Verbena	.....	.....	5	2
22. Alajuela	0	0	1	1
23. Nuestro Amo	.....	.....	11	2

FROST FIGHTING.

By ALEXANDER G. MCADIE, Forecast Official.

During the past five years the Weather Bureau Office at San Francisco has been called upon to give particular attention to the problem of lessening the injury to fruits by frost. By direction of the Chief of the Weather Bureau, during the year 1900 the forecast official for the southern half of the Pacific slope made an extensive journey through California, with the special purpose of studying the methods of protecting deciduous fruits from frost. This journey was the natural outgrowth of the excellent work inaugurated by Mr. W. H. Hammon, formerly professor in the Weather Bureau, while in charge of the San Francisco office. During the years 1897, 1898, and 1899 the unusually dry winter conditions, with frequent and prolonged frosts and lower temperatures than had been previously reported in many of the chief fruit growing centers of southern California, made it imperative that some steps should be taken to minimize the injury to citrus fruits by frost. The problem as presented to the forecast official was of a twofold nature: first, a study of the conditions preceding frost, so that he might with reasonable certainty give timely warning to the fruit growers; second, a study of the methods, means, and devices for protecting fruit from injury by low temperatures. The first has been solved with a fair measure of success. In the second problem the Weather Bureau had the valuable assistance of certain practical fruit growers, who willingly and readily tested the various devices proposed for smudging and cheerfully gave this office the benefit of the many practical experiments made by them in smudging, irrigating, heating, and covering. A bulletin on Frost fighting, by Alexander G. McAdie (Bulletin No. 29), was issued on March 13, 1900, and nearly three thousand copies distributed to those most interested in fruit growing. A previous bulletin (No. 23) upon Frost, when to expect it and how to lessen the injury therefrom, had been issued by the Weather Bureau on November 10, 1898, by Prof. W. H. Hammon, while a Farmers' Bulletin, No. 104, by Prof. E. B. Garriott, Notes on Frost, was issued June 15, 1899, which treated of frost protection in general.

It has become evident in California that the fruit grower must possess a degree of intelligence certainly as high as is demanded in any one of the usual vocations of life. The successful orchardist must be a skilled farmer and a good business man and, at the same time, be familiar with the chief principles of modern science. He must be chemist, entomologist, and physicist, as well as fruit grower. In the matter of protecting his crops from frost, for example, he must know exactly what method is best suited for his crop, for the locality, and for the season, and be prepared to act promptly, or else the greater portion of the year's profits will vanish in the course of a few hours.

In what follows extensive use will be made of Bulletin No. 29, since experience has shown that the principles of frost fighting, laid down therein, are essentially correct. While this bulletin was written chiefly with a view of protecting the citrus fruit crops of California, particularly of the section south of the Tehachapi, from frost, the principles hold, as a general rule, for the protection of deciduous fruits also.

In October and November, 1900, an attempt was made to extend the benefits of the Weather Bureau work in connection with frost, to the fruit growers of central and northern California, particularly to the growers of almonds, apricots, peaches, prunes, pears, apples, grapes, and figs. Many fruit ranches were visited, and the details of losses by frost gathered from ranch superintendents and others, together with all data available relative to the exposure of the fruit, the lay of the land, and the lowest temperatures. The following facts stand out prominently from the general mass

of statements. First, that in California the greatest injury is done deciduous fruits by the late spring frosts occurring as late as the 23d of May, when fruit is well formed, frequently resulting in the loss of three-quarters of the crop in the case of the more tender fruits, as for example, almonds and apricots. Second, in all the fruit ranches visited rough maps of the localities showed conclusively that the frost occurred chiefly in the low places, basins, and bottoms, or where the cold air had drained down and settled. The principle laid down in Bulletin No. 29, that frost was primarily a problem in air drainage, was conclusively upheld. *Wherever the air was stagnant the injury from frost was most marked; and conversely wherever the air was in motion, there was little damage from frost.* Fruit on open benches, hillsides, and terraces escaped. The streakiness of frost and the many apparent irregularities in its formation can be explained easily if we remember that there are currents and stream lines in the air, and that these currents may have rather sharply defined limits. A slow moving current of air on a still night in an orchard that appears to be nearly level may result in an absence of frost along its path, while close by, where the air is stagnant, frost will be formed.

A third particular point resulting from this visit to the ranches was the confirmation of the belief that the damage from frost could be greatly lessened if some means were provided whereby the chilled fruit could be protected from the sudden warming at sunrise. Some rough temperature observations made in ranches at about the time of sunrise on frosty mornings showed a rise of as much as ten degrees in the air temperature within thirty minutes. It was also noted in several ranches that the areas of greatest loss by frost were those where the sun's heat came suddenly upon the trees. It is believed that much fruit can be saved even when chilled or frozen if some screen is interposed between the fruit and the sun, so that the warming may be gradual. It is even admissible to thoroughly wet the fruit with cold water, and there are numerous instances of fruit escaping serious injury even when it has been covered with a thin coating of ice. It is of the utmost importance that the thaw for an hour or two following sunrise be gradual.

The following methods of protecting fruit from frost are taken from Bulletin No. 29:

METHODS OF PROTECTING.

Every fruit grower should put himself in communication with the nearest center of distribution of weather forecasts. If possible he should be in daily communication with some Weather Bureau office. Whenever frost warnings are issued for his locality he should carefully determine the temperature and dew-point, as elsewhere described, frequently during the late afternoon and night. A good outfit consists of a metallic thermometer so arranged as to automatically close an electric circuit and ring an alarm whenever the temperature of the air reaches 32°. In addition to a reliable sling psychrometer there should be some small device for testing the motion of the gentle air currents in the orchard. Too much attention cannot be given to this question of air motion. Many smudging devices have failed to be effective because of a slow movement of the smoke away from the orchard.

PROTECTIVE METHODS BASED ON MIXING THE AIR.

It is well known that lowlands are visited with frost while hillsides and hilltops escape. Every fruit grower should study the topography of his land and plant accordingly. Wind-breaks are, as a rule, considered detrimental. No hard and fast rule, however, can be laid down. On a well-known lemon and orange ranch at Santa Paula, the property of Mr. N. W. Blanchard, there are several large wind-breaks which have proven themselves to be of the greatest benefit in protecting fruit from frost. It would almost seem as if the citrus trees within a distance of 50 feet were directly protected by these wind-breaks. By planting a wind-break in the proper place, defects in the topography may be overcome and air currents established where otherwise pools of quiet air would have formed. A wind-break dense enough and so situated as to interfere with any natural circulation and facilitating the formation of still areas or pools would, of course, prove injurious.

PROTECTIVE METHODS BASED ON WARMING THE AIR.

A large number of small fires, advantageously placed, will raise the temperature of the air several degrees. The Riverside Horticultural Club, testing the various methods which were in use in California, came to the conclusion that wire baskets suspended a few feet above the ground, and holding several pounds of coal or charcoal, made an efficient protector. This method was described by Mr. Edward Copely, of Riverside, Cal., in several articles published in the Riverside Press of April, 1896. The cost of the wire basket is about ten cents, and if forty baskets be used to the acre, the cost of fuel will hardly exceed $2.50. To this must be added the cost of labor during the night and succeeding day in refilling the baskets. In the accompanying figs. 3, 4, and 5, Plates II and III, the baskets are shown in position. This method meets with most favor in southern California. The temperature can be raised certainly 3° or 4° with from twenty to forty of these baskets to the acre. It has been suggested that a number of small oil lamps be used with success for this purpose. Oil pots have been used and make a hotter fire, but the deposit of lamp black upon the fruit is objectionable. Some cheap modification of the ordinary plumber's furnace might possibly be devised which, by means of a moderate blast, would produce a high temperature.

PROTECTIVE METHODS BASED ON CLOUD OR FOG BUILDING.

Damp straw, old wood, prunings, manure, etc., when burned briskly furnish an effective smoke, and if the material while burning, is doused with water, the result is a dense steamy smoke, which, while trying to human lungs, serves as a screen to prevent loss of heat by radiation, and as a barrier between the chilled fruit and a sudden application of heat at the time of sunrise. Wet smudging has been tried in many ways with varying results. There are many reports of failure, and on the other hand, some definite results, showing the good accomplished by this method. Here, as in all other methods of protection, much will depend upon a careful study of the local conditions. Many a farmer smudges so that some neighbor gets the benefit of his work, while his own fruit remains unprotected. All motion of the air should be noted carefully, and this is sometimes difficult where the smoke is very dense. In some orchards sacks of old straw, soaked with oil, are so distributed as to be available for quick lighting. Portable smudges have also been devised. Fig. 6, Plate III, illustrates a portable device by Mr. Priestly Hall.

Mr. Hall has made an efficient form of sled operating on the wet smudge principle. Upon a sheet iron sled he has placed a small fire box, consisting of a grate 4 or 5 inches above the bed of the sled, over which pass iron rods bent in the form of an arch, leaving a space for the fire about 14 inches in diameter. This fire box is inclosed in a large corrugated iron box, which has the bed of the sled (about 3 or 4 feet in size) for a bottom, and sides 30 inches high. A door is made in front of the corrugated box to admit fuel to the fire. The box is filled with wet straw or manure, and a fire is maintained in the fire box when the machine is in operation. The cost is about $12; one will do for ten acres.

PROTECTIVE METHODS BASED ON IRRIGATION.

Of all methods proposed for the protection of fruit, excepting wire baskets, irrigation has the largest amount of evidence in its favor. It has been tried in many different places with different crops and has generally given satisfaction. Where water is not very plentiful, and this is the case strangely enough in some fruit sections, the method may not always be practicable, but with this exception there are many decided advantages in the generous use of water. Injury from frost depends almost as much upon the condition of the tree as upon the the severity of the weather. Critical periods in the life of the tree can be controlled to some degree by the use of water.

Some fruit growers hold that heat is the one thing that is desired at times of frost, and that the best method is that which produces heat by the simplest and least expensive process. Water, owing to its high specific heat, forms an excellent agency for the temporary storage of heat energy. We have seen that in the wet smudge an attempt is made to utilize the latent heat of vaporization, and theoretically this has always seemed the most advantageous method. A modification of the wet smudge is steam piped through an orchard. This experiment was made by the Wright Brothers at Riverside, Cal., with a 35-horse-power boiler and a main pipe 2 inches in diameter, from which, at right angles every 40 feet, pipes three-quarters of an inch in diameter were extended. It is claimed that the temperature was raised 3° whenever the steam was turned on. It is also said that the coal consumed would not be more than the amount used by the basket method. The estimated expense per acre would be about $75.

The latest device for the protection of citrus fruit against frost combines the good effects of irrigation with heating. This is a method known as the warm water method, tried at Riverside this year. An account of the experiment follows:

EXPERIMENT OF MR. ERNEST A. MEACHAM, RIVERSIDE, CAL.

"On the morning of February 9, 1900, at the Meacham Ranch, a test was made of the Meacham warm water method of protecting citrus fruits against frost. The experiment began at 3:45 a. m. and was conducted in the presence of a number of gentlemen belonging to the Riverside Horticultural Club, nearly all of whom were orange growers.

"At 6:30 a. m. the temperature of the ground 100 feet or more away from the boiler was 32°. The temperatures given herewith are those obtained by Mr. McAdie of the Weather Bureau with sling psychrometer No. 70; the number of the dry thermometer was 4487 and of the wet 4486. The plant consists of a 12-horsepower tubular horizontal boiler, laid in a brick furnace and arranged to deliver water with or without pressure. Cold water enters the bottom of the boiler and is delivered from the top orifice directly into the flume. The fuel used was crude petroleum, of which about 50 gallons were used in three and one-half hours. At the rate of 14 gallons an hour and an estimated cost of a little over 4 cents per gallon, the actual expense of fuel for the experiment was about 60 cents per hour. The oil is burned with a steam jet under pressure. A secondary 6-horsepower boiler, carrying 70 pounds of steam, was used. The oil is thus entirely consumed and makes but little smoke. The whole arrangement is such that not more than two men would be required to attend to all the details.

"Fifty minutes from the time of beginning, the water which had an initial temperature of 55.4° was raised 30°. Two sets of temperature records were made, one by Mr. Priestley Hall and the other by Mr. McAdie. In Mr. Hall's test 8 inches of water was run in 50 furrows, which barely ran the water past the ends of the furrows. In the second case 8 miners' inches of water was delivered into 25 furrows, thus carrying the heat farther down the furrows than in the first experiment. According to the present laws of California, a miners' inch is $\frac{1}{50}$ cubic foot per second; the "second-foot" is the quantity represented by a stream 1 foot wide and 1 foot deep, flowing at the average rate of 1 foot per second. A cubic foot of water, maximum density, weighs 62.4 pounds; a gallon contains 10 pounds of distilled water at 62°. The data obtained by Mr. Hall were as follows: 5:30 a. m., normal temperature, 34°; normal temperature of water, 60°; temperature of heated water, 92°; at the flume, 92°; 20 rods from the flume, 58°; 40 rods, 52°; temperature of unheated water 40 rods from the flume, 41.5°; vapor condensed on trees early in the morning and more condensed on the trees in the heated plat.

"Mr. McAdie's records are as follows: Time, 6:30 a. m., air temperature varying from 34° to 36°; temperature on the ground, 32°; frost was observed on grass blades; initial temperature of water, 55.4; heated water delivered to flume at 85.2; in a straight line down a furrow 200 feet from the boiler in the direction of the wind (motion of the air was very gentle) there was a fall in temperature of 14.2°; water vapor was observed rising to a height of about 4 feet; 200 feet from flume, as stated, the temperature of the water was 71°; the temperature of the surface soil 4 inches right and left of the water was 43°; temperature of the soil 16 inches from the water or in the middle of the ridge, 42.2°. It is presumed that the temperature of the ground, had no water been flowing, would have been 33°, and it would seem as if the soil itself was warmer by nearly 10°. At the end of a furrow, 600 feet, the temperature of the water was 54°, or there had been a fall of 31° in 40 rods; the temperature of the ground 4 inches from the water, 38°; 16 inches from the water, 36°; temperature of unheated water 50 rods from the flume, 40°.

"The approximate value of the plant was $200, and it is estimated that for a plant all equipped sufficient for a 10-acre grove $600 would cover all expenses. See fig. 7, Plate IV."

SPRAYING.

After frost, or rather just before a frost has ended, a spraying device can be used to advantage. Its chief function is to prevent a too rapid warming of the chilled fruit. It is said by horticulturists that even the light coating of ice formed in this way does not seriousiy damage the fruit. It is very likely that the latent heat of solidification set free by the change from water to ice may play a helpful part; but the chief effect is to prevent a too rapid thawing. In other words, both heat and water should be supplied to the chilled plant slowly, and according to the plant's ability to make good use of the same. At the A. J. Everest Ranch at Riverside, Cal., a portion of the grove is protected by sprinklers at the top of fifty-foot masts.

PROTECTIVE METHODS BASED UPON SCREENING OR COVERING.

All screening or covering devices are in effect modified hothouses, and there is no question but that a thorough protection can be accomplished. The expense is the one objection. Screens are made of light materials, namely, canvas, muslin, or light wood work, and have been used with considerable success. At the A. J. Everest Ranch an elaborate structure of lath screens is in use, illustrations of which are given herewith (see figs. 8 and 9, Plates IV and V). There is no question as to the value of the protection, but the expense is considerable, averaging perhaps $400 to the acre. This lath covering may be considered as forming a well ventilated hothouse.

NOTES BY THE EDITOR.

MR. HOWARD SHRIVER.

Mr. Howard Shriver, the well-known meteorological observer, was born at Sandy Mount, near Baltimore, Md., November 8, 1824, and died February 5, 1901, in Cumberland, Md., where he had spent most of his life, and of which city his father, Thomas Shriver, was formerly mayor. His interest in weather observations began at an early period. He began observations while living in Virginia in 1866, and the Editor well remembers his visit to the Central Office in Washington in 1873. He had a genuine love for the study of natural science and took the greatest pleasure in communicating his results to others. He was particularly interested in the study of the climate and flora of the neighborhood of Cumberland. His elder brother, Edwin Thomas Shriver, had begun a meteorological record in January, 1859, and the combined record of the two brothers, therefore, extends forty-two years, or to January, 1901. A summary of the principal results of these observations is published in the report on the geology of Allegheny County recently issued by the Maryland Geological Survey. Mr. Shriver's instrumental equipment was unusually complete for a voluntary observer. He was one of the best known citizens of Cumberland, a favorite with the children and the school officials, and a great gathering attended the commemorative public exercises held on February 24 in the Academy of Music. A fuller account of Mr. Shriver's work is given in Dr. Fassig's notice, published in the February report of the Maryland and Delaware Climate and Crop Section.

DR. EARL FLINT.

Dr. Earl Flint, M. D., for many years voluntary observer of the Weather Bureau at Rivas, Nicaragua, died January 21, 1901. He will be remembered by students of Central American climatology as the one meteorological reporter in all that great region, stretching from Mexico on the north to the Isthmus of Panama on the south, who made a continuous record of the weather for upward of twenty years. Dr. Flint's meteorological work began in 1881 and continued without interruption until his last illness.

Dr. Flint was a student of archæology and ethnology as well as of meteorology. Before locating in Rivas he had traveled extensively, not only in Mexico and Central America, but throughout the more northern countries of South America. During his travels he found opportunity to make a number of interesting and important archæological collections, some of which were later in his life deposited in the National Museum in Washington, D. C. He was always a student of material things, an intelligent observer, a zealous collector, and an honored citizen of his adopted country.—*A. J. Henry.*

HERBERTSON'S DISTRIBUTION OF RAINFALL OVER THE LAND.

In the important and elegant Atlas of Meteorology edited by Buchan and Bartholomew and recently published by Archibald, Constable & Company, of London, there are re-

produced, among other charts, the rainfall of the world in four seasons by Dr. A. Supan, and also twelve monthly charts by Dr. A. J. Herbertson. Both of these sets of charts are, however, on the Mercator projection and on too small a scale to be easily consulted. Subsequently, Dr. Herbertson has been able to slightly amend his original charts, which seem to have belonged to his dissertation for the attainment of the degree of Ph. D., at the University of Freiburg in Breisgau, in 1898. This dissertation is entitled The Monthly Rainfall over the Land-Surface of the Globe, and has been printed in English. A new edition of this dissertation to accompany a new set of charts, twelve monthly and one annual, on a much larger scale, is entitled The Distribution of Rainfall over the Land, London, 1901, and is published, apparently, as a separate pamphlet, by the Royal Geographical Society. In the text Dr. Herbertson gives numerical data when it is not easily accessible elsewhere, but does not reprint that given in his lists of data and bibliography or in Dr. Supan's Distribution of Precipitation, published in 1898 as one of the Ergänzungshefte of Petermann's Mittheilungen. The text of the two pamphlets differs principally in that the second pamphlet contains, on pages 53–56, certain remarks on the annual and seasonal distribution that do not occur in the original dissertation.

In general this memoir gives thirteen maps of the globe on Lambert's equal area azimuthal projection for each month and for the year the distribution of rainfall over all the land surfaces where observations have been made. Nothing is said about rainfall on the ocean except to refer to the new edition of the memoir by Mr. W. G. Black, published by the Geographical Society of Manchester, Edinburgh, 1899.

In his general remarks Dr. Herbertson says:

> There are seven well-marked bands of high and low rainfall girdling the earth, viz: (1) The subequatorial wet belt; (2), (3) the subtropical dry belts; (4), (5) the temperate wet belts; (6), (7) the polar dry belts. These hyetal belts move north and south during the year with the sun. In equatorial regions there are two wet and two dry seasons every year; most rain falls when the sun is highest, at noon, except on the west coasts of temperate lands. Rain can fall steadily and in considerable quantities only when there is a steady cooling of the atmosphere, as when (1) the air steadily moves from warmer to cooler regions, or (2) when it has an ascending convectional movement, as in equatorial regions when the sun is overhead at noon, or (3) when the convectional movement is in connection with the complicated atmospheric disturbances called cyclones, or (4) when a range of mountains deflects the surface winds into higher regions. The ascending convectional movements, 2, 3, and 4, are the most important sources of rains, and occur when the sun is highest in the heavens. In general, the maximum rainfall occurs when the sun is nearest the zenith at noon, viz, (1) in summer, for places beyond the Tropics; (2) about the time of the equinoxes, for places at the equator; and (3) at intermediate times, at other intertropical stations. The winter cyclones of the temperate belt can not penetrate far into the interior of the continents, where a great high-pressure system exists; hence the rains may be heavy on the coasts, but do not spread far inland. On the other hand, in the summer the low-pressure areas over the continents are the goal of steady winds, slowly inflowing from all sides. The summer rains are in part the outcome of the greater capacity of the atmosphere for vapor, since this capacity increases more rapidly than the temperature, so that the same amount of cooling yields a greater rainfall from air that is saturated at high temperatures than at low temperatures. Much summer rain has its origin in local evaporation. The water must be replaced if the rainfall is to continue. It can only come from the oceans. Hence a slow current of vapor must steadily flow into the region of summer rains. The normal trade winds are usually dry and are passing from regions of low temperature to those of high temperature. The trades do not cause any rain as long as they are not forced upward. Thus the flat llanos of South America are dry while the northeast trades rule over them, and in winter these trade winds affect only a narrow strip of mountainous coast land; but in summer, when the trade winds are sucked in toward a well-developed low pressure, they become the source of the heavy convectional rains, as in the case of the Asiatic monsoon rain. The influence of ocean currents on rainfall is indirect, through the temperature of the air. The most interesting example of this is the low rainfall on the tropical west coasts of the continent.
>
> The effects of mountain barriers are seen in the Monthly Rainfall Maps. The line of maximum elevation is not necessarily the line of heaviest rain; the latter may lie on the leeward slope of the mountains or at some distance from the edge of a plateau. The air may continue to rise for some distance as it moves beyond the ridge, and the maximum precipitation may occur even beyond this line, and not on the windward slope.

Herbertson's monthly and annual charts supply a long felt want and will be made the foundation of many studies. They came in very opportunely in connection with the Editor's recent exposition of the physical basis of long-range seasonal forecasts of rainfall.

THE STORMS OF THE HAWAIIAN ISLANDS.

Under date of March 8, Mr. Curtis J. Lyons writes that an examination of the United States daily weather maps shows that—

> The connection between our November storms and the lows that appeared on the Oregon and Washington coast is, I think, very apparent.
>
> The storm that prevailed here from February 5 to 14 very evidently came up from south-southwest, as we had a southeast to south-southeast gale for two or three days, previous to the southwest winds—this is unusual. The barometer fell to 29.48, the lowest for twenty years.

THE RAINFALL AND EVAPORATION OF GREAT SALT LAKE.

On a previous page we publish a paper by Mr. Simon F. Mackie dealing with the changes of level and the total rainfall. This question is one that has been discussed in previous numbers of the MONTHLY WEATHER REVIEW, but will always interest meteorologists and geologists. Any solution of the question of rainfall, evaporation, inflow, and outflow that applies to Great Salt Lake, will doubtless also apply to many other lakes throughout the world. In general it must be remembered that the rainfall records for one or two stations in the neighborhood of the lake, or within its watershed, may not be perfectly representative of the whole watershed. The following table is furnished to the Editor by Prof. A. J. Henry as containing all the data in the archives of the Weather Bureau from stations in the watershed of the Great Salt Lake.

Rainfall in inches in Salt Lake watershed.

Year.	Salt Lake City.	Ogden.	Coalville.	Provo.	Logan.
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
1874	14.67	.....	.....	.....	.....
1875	23.64	20.69	21.02	.....	.....
1876	21.28	14.80	14.20*	.....	.....
1777	16.35	13.95	11.75	.....	.....
1878	19.75	15.11	10.71	.....	.....
1879	13.11	12.35	.....	.....	.....
1880	10.94	10.24	.....	.....	.....
1881	16.93	10.13*	.....	.....	.....
1882	15.98	9.07	.....	.....	.....
1883	14.24	10.98	.....	.....	.....
1884	17.52	19.49	.....	.....	.....
1885	19.69	19.40	.....	.....	.....
1886	18.89	12.60	.....	.....	.....
1887	11.66	9.14	.....	.....	.....
1888	13.62	12.03	.....	.....	.....
1889	18.46	16.91	.....	.....	.....
1890	10.33	18.61	.....	.....	.....
1891	15.82	23.11	.....	.....	.....
1892	14.08	14.20	.....	.....	.....
1893	17.35	16.97	.....	.....	14.51
1894	15.27	16.04	.....	10.21	14.36
1895	11.95	.....	.....	10.57	13.51
1896	18.42	13.95	.....	.....	16.15
1897	16.74	.....	.....	.....	17.45
1898	16.09	.....	.....	13.95	13.18
1899	.....	13.53	.....	.....	12.60
1900	.....	.....	.....	.....	15.06

* Somewhat doubtful.

By plotting the stations it will be seen, as Professor Henry states:

> That the rainfall record at Salt Lake City may be taken to represent the average rainfall over a belt of country 20 to 30 miles wide, but not

wider, on the eastern shore of the lake. As one goes eastward the rainfall appears to diminish slightly. We have no record of the rainfall on the higher mountain ranges directly east of Salt Lake City.

To this we must add that the precipitation on these mountains is undoubtedly larger than in the lowlands. Moreover, there seems to be no record whatever of the amount of rain over the western portion of the lake and its watershed. For accurate and satisfactory study one ought to have river gagings sufficient to determine within 5 per cent the monthly and annual inflow into the lake on all sides instead of the few rainfall measurements that at present so imperfectly represent the rivers and the seepage.

With regard to the evaporation we can do no better than to state that inasmuch as it depends upon the temperature of the lake surface, on the sunshine and cloudiness, on the dryness of the air, and especially on the total wind movement, which latter depends upon both velocity and duration, it must be evident that it is impossible to make an accurate calculation of its total amount unless we have continuous records that are not now available. The best we can do is to make a general application of the investigations by Prof. Thomas Russell. See his Depth of Evaporation in the United States, MONTHLY WEATHER REVIEW, September, 1888, pages 235–239. In this memoir he shows that for Salt Lake City during the year July, 1887 to June, 1888, the depth of evaporation, in inches, from a surface of fresh water kept in a thermometer shelter at the Signal Service station would have been:

	Inches.		Inches.
1888, January	1.8	1887, August	10.7
February	2.7	September	9.6
March	3.6	October	6.5
April	7.2	November	5.0
May	6.9	December	2.3
June	8.9		
1887, July	9.2	Total annual	74.4

What the evaporation from a surface of salt water would have been we do not know.

In the Annual Report of the Chief Signal Officer for 1889, pages 159–172, Professor Russell gives an elaborate study of the rainfall and outflow in the Mississippi Valley showing that in general when the rainfall is heavy a much greater part of it reaches the river than when it is light; the ratio varies from $\frac{1}{2}$ to $\frac{1}{10}$.

It is hardly likely that the sum total of the influences of sunshine and cloudiness, dryness, and wind as affecting evaporation can be combined with the effect of rainfall and run off so as to be expressed by any simple function of the rainfall. But evidently we need more rainfall stations and a more complete record of the seepage through the soil and of the flow of streams into Salt Lake.

HARVARD'S METEOROLOGICAL STATIONS.

In a recent number of the MONTHLY WEATHER REVIEW we have described the important series of meteorological stations maintained during several years past in South America by the astronomical observatory of Harvard College, and extending from the Pacific Ocean to the Desert of Atacama and beyond. We regret to learn that this important work is now discontinued. However, undoubtedly, extensive additions to our knowledge will appear when the results are reduced and published. The following quotation is taken from the fifty-fifth annual report of Prof. E. C. Pickering, director of the observatory:

Meteorological observing stations have been maintained during the year at Mollendo, altitude 100 feet; La Joya, 4,150; Arequipa, 8,060; Alto de los Hiesos, 13,300; Mont Blanc, 15,600; El Misti, 19,200; Vinocaya, 14,600, and Puno, 12,500. Great difficulty has been found in carrying on the observations at the lofty mountain stations. Whenever possible all the stations have been visited once a month by a member of the staff of the Arequipa station, and the self-recording and other instruments compared with various standard instruments, including a mercurial barometer and a psychrometer. Instruments designed and constructed by Señor Muniz, for recording automatically the velocity and direction of the wind, have been placed at all the stations, except those already provided with anemometers. The meteorograph which failed to give satisfactory results at the summit of El Misti has been placed at the Mont Blanc station, and has given records for about one-half of the time. The observations at these different stations have now been continued in many cases for eight or ten years. At such stations, where from the necessities of the case, the observers are generally men of limited education and experience, observations of the greatest accuracy can not be expected, except by maintaining trained observers at greatly increased expense. It is believed that the personal observations which have been secured, and the results of the records of the self-registering instruments, will furnish valuable information to meteorologists concerning a region about which little was previously known. Taking into consideration the striking uniformity of conditions which prevail in different years in this region, it is probable that additional observations would not greatly increase our knowledge. It has been decided, therefore, to suspend, at the end of the year 1900, the meteorological observations of all the stations except those at Arequipa.

REFLECTION BY CLOUDS OF LIGHT FROM A DISTANT FIRE.

Mr. T. S. Outram, Section Director at Minneapolis, Minn., reports that on the evening of March 14, between 9 and 10 p. m.:

A vertical shaft of light of a dull red color, situated about 15° from the zenith was observed bearing about 60° east of north. At that time there was a very brilliant conflagration at the distance of a mile or more in that direction. When first seen the sky for some distance around the shaft of light was partly overcast with fine cirro-cumulus clouds, and above these thin cirro-stratus clouds. The phenomenon was on the higher clouds and was distinctly seen through the ruddy reflection on the cirro-cumulus clouds. Later the cirro-cumuli passed off entirely, leaving the cirro-stratus, which were so thin that a few stars could be seen near the zenith. By 9:30 p. m. the sky was apparently clear, but at that time the shaft of light was so faint that it could hardly be seen. The greatest length of the shaft was equal to the distance between the two outer stars of the bowl of the Great Dipper. During the whole time the wind was north, blowing from 20 to 25 miles per hour.

The above description shows that we have here to do with the reflection of a distant light from the horizontal flat under surfaces of the crystals of snow that usually form cirrus clouds. When the sun is in a proper position near the horizon its rays are similarly reflected and give rise to vertical beams of light that usually form an integral part of solar halos. Of course, these crystals could not maintain their surfaces horizontal unless the air were very quiet, allowing them to settle downward very slowly.

HISTORY OF METEOROLOGY IN BELGIUM.

For sixty-seven years the Royal Observatory of Belgium has regularly published its Annuaire de l'Observatoire Royale, devoted to astronomy and meteorology, but, beginning with the year 1901, it will publish two separate works, viz, the Annuaire Astronomique and the Annuaire Météorologique. These small 16mo volumes will correspond to the quartos, viz, the Annales Astronomiques and the Annales Météorologiques, which began to be published separately in 1881. Magnetic phenomena will be published in connection with the Annuaire Astronomique, since the astronomical director, Dr. L. Niesten, has especially interested himself in this subject and is preparing to continue and publish the magnetic survey carried out by Houzeau and Estourgies in 1878–1882. A monthly magnetic bulletin in 16mo will be published, giving a résumé of the results of the self-registering instruments at the observatory, which is located at Uccle, near Brussels.

The Annuaire Météorologique for 1901 contains, among other interesting articles, a review of the history of meteor-

ology in Belgium by J. Vincent, meteorologist at the observatory, which contains exhaustive references to the literature of the subject, beginning in fact with Charlemagne, who promulgated and established the use of twelve compass points instead of the sixteen now used in the notation of the winds, viz, east, east by south, south by east, south, south by west, west by south, west, west by north, north by west, north, north by east, east by north, all which were sometimes known as the twelve apostles.

The most ancient name that can actually be cited in meteorological matters is Thomas of Cantimpré, who was born in Brabant in the early part of the thirteenth century and was the author of the work Die Naturis Rerum, which was finished about 1250 and often attributed to Albert the Great. The history of modern scientific meteorology in Belgium begins with Simon Stévin, born at Brussels in 1548 and died in Holland in 1620. His ideas as to gravity, hydrostatics, the fall of heavy bodies, the weight of the air seem to have been quite correct. He first gave two methods for determining the elevations of the clouds. In one method, assuming that the cloud is isolated in the sky and almost stationary, he measures the angular altitude of the cloud and takes a corresponding measure of the location of its shadow on the ground. In the second method he makes two measures of the angular altitude, from the extremities of a base line, the cloud being near the zenith. His ideas on geology and other branches of science were generally clear and correct. In Girard's translation of the works of Stévin he interpolates ideas of his own, such as the vesicular theory of cloud particles which was not at all known to Stévin. To another Belgian meteorologist, F. d' Aiguillon, born at Brussels in 1556, we owe the methods of projection known as orthographic, stereographic, and scenographic, as well as investigations into the optical phenomena of the atmosphere. Of later authors Fromondus (or Libert Froidmont), Fienus (or Feyenes), Vendelinus (or Wendelin), F. Linus (or F. Hall), Sluse (or R. F. Walter), L. Gobart, F. Verbiest, J. A. Brown, (born in 1702, died in 1768) are especially mentioned.

A chapter is devoted to the earthquakes observed in Belgium, of which the earliest occurred in the year 330, and the next in 502, but of course only prominent, destructive quakes are mentioned in the early records. At the present time every tremor is recorded by self-registering apparatus and the periodicities, both diurnal and annual, seem to be present.

After a section devoted to fundamental meteorological data and tables of reduction, the Annuaire gives an elaborate account of two ancient meteorological journals, one relating to the period 1778–1810, the other to the period 1807–1850. This is followed by an article on the climate of Ardenne, written at the request of the Belgian Department of Agriculture. These and several essays together make the Annuaire for 1901 an interesting contribution to meteorology.

OFFICIAL STANDARD TIME.

In the Astronomical Annual for 1901 of the Royal Observatory of Belgium, the director, Dr. L. Niesten, says that—

> In the astronomical annals we shall continue to make use of local meantime until that very desirable epoch when astronomers shall agree to substitute civil time for it.

Civil time begins at midnight, and should be counted onward for twenty-four hours; astronomical time begins at noon, and is counted onward for twenty-four hours.

Official time in Belgium is the civil time for the meridian of Greenwich. This is the legal time used by government officials, railroads, and post offices, and may be called public or popular time. The legal time in other countries is stated by Dr. Niesten, on page 159 of this Annuaire, to be as follows:

Western European time, or the civil time of the Greenwich meridian, is legal in England, Belgium, Holland, and Luxemburg. In Belgium the 24-hour notation has been used since May, 1897, in the post office, telegraph, and telephone departments, as also by the railroads and the navy.

Central European, or one hour east of Greenwich, is legal in Germany, Austria-Hungary, Bosnia, and Herzegovina, the Congo Free State, Denmark, Italy, Servia, Sweden, Norway, and Switzerland. In Italy the hours are counted from midnight on to twenty-four.

The meridian of one hour thirty minutes east of Greenwich is adopted by the railroads and telegraphs in Cape Colony.

Eastern European time, or the meridian of two hours east of Greenwich, is adopted by Bulgaria, Roumania, and Natal, and by the railroads of Turkey in Europe. The meridian of eight hours east of Greenwich is adopted by West Australia.

The meridian of nine hours west of Greenwich is adopted by Central Australia and by Japan.

The meridian of ten hours east has been adopted by Victoria, Queensland, and Tasmania.

The meridian of eleven and a half hours has been adopted by New Zealand.

As is well known, Canada and the United States and Mexico have adopted as standard hours the fifth, sixth, seventh, and eighth west of Greenwich. In Canada the notation from zero to twenty-four continuously has also been authorized.

The 24-hour notation has also been introduced into the railroads of British India, where the fifth and sixth hours east of Greenwich are commonly used as standard meridians.

The eighth hour east of Greenwich would be appropriate to the Philippines, but we do not know that the American authorities have issued any regulations bearing on this point.

The Hawaiian Islands adopt the meridian of ten and a half hours west of Greenwich.

The nations that have not adopted the Greenwich system are as follows:

In Spain the legal hour is that of the meridian of Madrid, or 14*m* 45*s* west of Greenwich; in Spain the 24-hour enumeration has lately been adopted.

Portugal adopts the time of the meridian of Lisbon, or 36*m* 39*s* west of Greenwich.

Russia adopts the meridian of St. Petersburg uniformly for its whole domain, or 2h. 1m. 13s. east of Greenwich.

The above data may differ slightly from that published elsewhere. In fact, it is difficult to gather correct statistics for all parts of the world, and the Editor will be pleased to publish any corrections or additions to this list.

It is important to bear these standards in mind when one wishes to compare the exact time of occurrence of any event that is observed in two different countries. We recall vividly a remarkable discrepancy in the hourly temperature records kept in a certain hospital where the morning readings were made by a subordinate who happened to be a Frenchman, and the afternoon readings by one who happened to be a German. The thermometer was unfortunately graduated in the Centigrade system on one side and the Réaumur system on the other. As a matter of course, the morning records were kept in the former and the afternoon records by the latter system. Nothing was said about this in the published records, and it took the Editor a long time to ferret out the cause of the discrepancies. Doubtless, analogous discrepancies are introduced every day by the differences between sun time, local mean time, and legal standard time. In proportion as we progress toward one absolutely uniform standard of time, such as Greenwich, we shall eradicate discrepancies and increase the accuracy of all work in terrestrial physics.

THE WORK OF THE METEOROLOGICAL INSTITUTE OF PRUSSIA.

The Meteorological Institute of the Kingdom of Prussia, (K. Preussische Meteorologische Institut), directed by Dr. von Bezold, includes: (1) The Central Institut of Berlin, divided into four sections: (*a*) Climatology and miscellaneous; (*b*) atmospheric precipitation and library; (*c*) storms, accidental atmospheric phenomena and instruments; (*d*) aeronautics;

(2) Observatory of Potsdam of which Dr. Sprung is director, including two sections; (*a*) meteorology and terrestrial magnetism; (3) 202 stations, of which 148 are in Prussia (123 first and second order, 71 third, and 8 fourth order).

In the course of the year 1899 the number of rainfall stations was increased by 70. January 1, 1900, it was raised to 2,315, including the 202 meteorological stations just mentioned. The study of atmospheric precipitation is of great practical importance; it interests agriculture as well as industry; now that the rivers have again become very important mediums of transportation and that they are the sources of energy, it is of the utmost importance to be acquainted with their regimen and their sources of supply.

In this same train of thought the Meteorological Institute of Prussia carried on in December, 1899, observations of the depth of snow on the ground and its equivalent in water, and established a service of forecasts bearing on this subject. Thus, December 19, it was able to send to the hydrographic services of the five great rivers of Germany dispatches indicating the depth of the snow in the five basins, observed the day before at 7 a.m. The geographers and the meteorologists can refer for details to the weekly reports as to the depth of snow on ground in north Germany.

The annual report of the Royal Meteorological Institute of Prussia contains the list of the publications issued either by this scientific establishment or by its colaborers.

TEMPERATURE OF DEEP LAKES.

In the MONTHLY WEATHER REVIEW for 1898, page 167, we have mentioned the thermophone devised by H. C. Warren and G. C. Whipple, and first described by them in the Technology Quarterly, 1895, Vol. VIII, pages 25–152. A previous elaborate paper by Prof. W. R. Nichols was read in 1880 before the Boston Society of Natural History. Observations relating to Clear Lake, N. B., were made by Prof. W. F. Ganong of Smith College, Northampton, Mass., but those made by the inventors and Mr. Desmond Fitzgerald in Lake Cochituate were more elaborate and established the great value of this apparatus. Previous to that time the deep sea thermometers of Negretti and Zambra or Casella were the best available. H. B. de Saussure used in Switzerland an ordinary thermometer so protected that it could be hauled up a thousand feet without changing its temperature 1° centigrade. A series of observations by the older methods had been carried on for five years by Mr. Fitzgerald before the thermophone became available; the results of both series mutually confirm each other. A similar series was observed at Lake Winnepesaukee and several other lakes or reservoirs and the general results of both American and European observations are given in the paper by Fitzgerald published in the Transactions of the American Society of Civil Engineers, Vol. XXXIV, pages 67–114.

In general, Mr. Fitzgerald showed that there is an annual inversion of the vertical circulation in a fresh water pond, by reason of which when in winter time the lowest portions begin to cool below 39° Fahrenheit or 4° centigrade they rise because of their diminishing specific gravity and bring up the products of decaying vegetation.

In a shallow lake, such as the reservoir, this circulation produces an appreciable discoloration and contamination of the upper water at certain seasons; it is therefore a matter to be considered in connection with the supply of fresh drinking water for a city. On the other hand, the study of temperatures in very large natural lakes is a matter of scientific inquiry leading to important results in connection with the temperature of the air and the occurrence of fog, cloud, and rain, the melting of ice floes, to say nothing of the distribution of fish and marine plants; it may also have a bearing on other questions not yet fully appreciated. The most recent contribution to the subject is a study of the temperatures of Lake Ladoga, which is the largest and one of the deepest bodies of fresh water in Europe. The Editor would, however, suggest that possibly the lower portions of Lake Ladoga are salt water, just as in case of some lakes near Boston which apparently owe their origin to a glacial process similar to that which gave rise to Lake Ladoga. In the Paris Comptes Rendus for June, 1900, Lieut. Jules de Schokalsky of the Russian Navy, published a map of Lake Ladoga and the results of his own examination of its temperature for the years 1897–99. As similar investigations should undoubtedly be made on our great American lakes we reprint this article; evidently the thermophone will do the work more satisfactorily than the "upset thermometer."—ED.

ICE CAVES.

On a preceding page we print a short account of the ice cave at Flagstaff, Ariz. There are many well-known cases in which glacial ice has been covered by earth to such a depth that it has been preserved for thousands of years, and the caves or wells penetrating therein preserve a temperature of 32° throughout the year. These, however, represent a very different phenomenon from that reported by Mrs. Renoe. In the ice cave at Flagstaff we have probably nothing to do with glacial ice; the ice is evidently formed annually within the cave and on the surfaces of its crevices. The ground around the caves can not have a temperature below that of freezing. The air temperatures at Flagstaff during December, January, and February frequently fall below freezing, and this wave of cold will penetrate many feet into the earth by the middle of summer, but this of itself would only give a low temperature in the ice caves and would not suffice to explain the formation of such masses of ice. It merely shows why the water percolating slowly into the caves must be of a low temperature. If there be a gentle circulation of the air going on, there must be a corresponding evaporation of a portion of this water, which will, of course, reduce the temperature still lower. Now, the dryness of the air at Flagstaff is often such that the temperature of the wet bulb thermometer is below freezing, and if there be a gentle circulation of such air within the cave, then ice may be formed.

Again, the entrance to the Flagstaff cave is at the bottom of a general depression in the ground; it must, therefore, receive the very cold air that settles into such hollows during clear nights; this air is cooled by contact with the surface of the ground, which latter is cooled by radiation to the clear sky. Even during the warm summer months the nocturnal radiation at this altitude (about 7,000 feet) is sufficient to produce temperatures below freezing, so that the water percolating through the soil into the cave may be frozen by contact with the cold air within the cave if the latter is slowly renewed every night.

The formation of ice in the cave near Flagstaff is undoubtedly not an isolated case and similar examples should be sought for and brought to the attention of the readers of the MONTHLY WEATHER REVIEW. Those interested in the subject would do well to test our suggested explanation by making accurate observations of the temperature and moisture of the air close to the surface of the ground at the time of the morning minimum temperatures, and especially during the summer months.

The Ice Trade Journal has from time to time published accounts of similar ice caves in various parts of the world. The February number states that about twelve miles from Ehrenbreitstein and a short distance from the Wallmerod

station between two hills, the Blasinsberg and the Dornberg, there are ditches from five to twenty-five feet deep in which natural deposits of ice occur all through the hot summer; even with temperatures of 90° in the shade, the ice forms at night-time. The Dornberg is composed of basalt and in its lower portions are deep crevices out of which pours an icy wind in the summer season while in the winter season a relatively warm current of air flows out. At the foot of the hill there bubble up many cold springs having a temperature of 39° all the year round.

According to the Ice Trade Journal the entrance to the ice cave of Flagstaff is in a region of pine woods and the cave is in a formation of lava which caps the entire country. The main cavern is entered through a narrow slit in the "malapai rock." The ice is very hard and fills every nook and cranny beyond the short, dark hallway that leads inward. Whenever the ice is dug away it seems to grow again from behind. The region is almost destitute of surface water or well water and the mean temperatures are far above freezing

WEATHER BUREAU MEN AS INSTRUCTORS.

Mr. J. Warren Smith, Forecast Official, Columbus, Ohio, delivered four lectures before the Farmers' Institute at Ottawa, Ohio, January 25 and 26. The subjects were: "Weather forecasts and warnings, how they are made, distributed, and utilized"; Frost warnings and the protection of crops from frosts"; "The farmer and the Weather Bureau"; "Lightning and the electricity of the air.

Mr. Smith also delivered three lectures before the West Jefferson Farmers' Institute, February 15 and 16, and one lecture before the Farmers' Institute at Sunbury, Ohio, on February 23.

During the spring term of 1899, at the Ohio State University, Mr. Smith delivered a series of lectures on meteorology, which are now incorporated in the regular course twice a week in the second and sometimes in the third term as a part of the required work of students in agriculture and horticulture. Mr. Smith has received an official appointment as lecturer on meteorology to the Ohio State University and is attached to the Astronomical Observatory, under the directorship of Prof. H. C. Lord.

Mr. Charles E. Linney, Observer, Weather Bureau, lectured on February 5 before the Kendall County Farmers' Institute at Yorkville, Ill., on "Weather forecasting."

On March 11 Mr. Linney addressed the Engineering Department of the Armour Institute of Technology in Chicago, on "Meteorology and 'weather forecasting." The address was very well received.

Mr. Patrick Connor, Observer, Weather Bureau, lectured on "Unusual meteorological seasons," on February 13, at the regular monthly meeting of the Academy of Sciences, Kansas City, Mo.

Mr. Henry B. Patrick, Observer, Weather Bureau, gave a talk, on February 15, to the high school pupils at Marquette, Mich., on "Marquette station and the study of storms."

The catalogue of the University of Cincinnati for 1900–1901 shows that elementary meteorology will be offered in the course of instruction during the coming summer term. Mr. R. S. Bassler, son of our colleague, Mr. S. S. Bassler, Local Forecast Official in Cincinnati, will have charge of the instruction in geology and meteorology. Laboratory work will include the use of instruments, taking observations, charting weather conditions, and forecasting. A few additional lectures will be given by Mr. S. S. Bassler himself.

Mr. Wm. G. Burns, Section Director, Phoenix, Ariz., gave an address on March 7 to a special delegation of public school teachers on "The Weather Bureau and meteorological topics." An arrangement has been made by which advanced classes of the high school will visit the office and discuss similar topics.

Mr. R. B. Harkness, Observer in Charge, Houghton, Mich., reports that he delivered two addresses on February 21 at Chassell, Mich.; one to the High School "On the Weather Map," and subsequently one to the Century Club and invited guests "On the United States Weather Bureau and its work." On March 13 he conducted a series of observations to determine for the school board the humidity and volume of air delivered by a new ventilating apparatus in each of the 25 rooms of the new Houghton High School Building.

Mr. I. M. Cline, Local Forecast Official and Section Director, has been authorized to accept the invitation of the South Texas Truck Growers' Association to deliver an address "On the use of weather forecasts in the protection of fruits and vegetables." In view of the great extent of this truck industry and the interest manifested by the members of the association, Mr. Cline believes that such an address will result to the benefit of both the farmers and the Weather Bureau. It will be delivered at Edna, Tex., May 7–9.

Mr. E. A. Beals, Forecast Official at Portland, Oreg., lectured on February 26, 1901, to the students of the University of Oregon at Eugene, Oreg., and on March 1, 1901, to the students of the Pacific University at Forest Grove, Oreg.

On February 13 Mr. Charles Stewart, Observer, Weather Bureau, Spokane, Wash., gave a lecture to the pupils of St. Stephen's Episcopal School for Boys. On March 22 Mr. Stewart lectured to the faculty and students of Gonzaga College on the subject of "Atmospheric Pressure," with particular reference to the cyclonic areas of middle latitudes. An experiment was made with a glass of water and a sheet of paper to demonstrate the pressure within a fluid; from this and the transmissibility of pressure in liquids the principle of the mercurial barometer was deduced. This was the first of three lectures to be given at Gonzaga College.

Mr. W. M. Wilson, Section Director, Milwaukee, Wis., reports that during the month of February he delivered lectures on weather forecasting before the University Club, the Milwaukee Medical College, the Oconomowoc High School, and the State Normal Schools at Stephens Point and Oshkosh. He notes that it was a matter of particular gratification to observe the excellent work in meteorology being accomplished

both at the State Normal Schools and the Oconomowoc High School. He adds that the faculty of the Milwaukee Medical College has invited him to outline a course and take charge of the instruction in the elements of meteorology with special reference to medical climatology. The course will begin in September, 1901.

Mr. Leonard M. Tarr, Observer, Weather Bureau, New Haven, Conn., states that during the past two years classes from Yale University have visited the office several times and have been instructed in the use of instruments and the practical work of the Weather Bureau. The faculty of the University have now requested Mr. Tarr to give a more complete course in meteorology covering two hours each week during January and February, 1902. Mr. Tarr is taking a post graduate course in physics, looking to the degree of Ph. D.

Such requests as that mentioned above, whether they are made directly to the observer or indirectly through the Chief of Bureau, are always most heartily indorsed by the Chief, provided the work does not interfere with the official duties of the observers. The interest in meteorology thus manifested by one of our wealthiest universities, already famous by the works of Silliman, Herrick, Newton, and Loomis, encourages one to hope that this important field of science may be properly represented, and that observational, practical, and theoretical meteorology may be diligently cultivated.

ENGLISH VS. METRIC SYSTEM OF MEASUREMENTS.

The progress of meteorology among the different nations of the world is favored or retarded by a variety of circumstances. Thus, in Great Britain and her colonies there is an abiding interest in the weather and in superficial climatology or the description of the prominent features of the climate. The tendency is to look at the weather from a navigator's and a workman's point of view. It is difficult for the average Englishman to apply the methods of the physical laboratory to the problems of meteorology, perhaps, because he sees the intense variability of atmospheric phenomena, and he seems to have no hope of applying to the real atmosphere any of the solutions that the physicist offers him bearing on simpler or idealized problems. Perhaps, also, as suggested by Mr. W. M. Shaw, the Secretary of the Meteorological Office in London:

> There is a great gulf between the physicist and the meteorologist, in that these two branches of science are accustomed to make use of different sets of units, viz, the English and the metric systems, so that a separation has grown up in England between the laboratory and the observatory such as does not exist on the Continent.

In the Bulletin of International Simultaneous Observations the Editor long since undertook to remove this difficulty by presenting all the data for the Northern Hemisphere in both systems of measurement side by side. The international meteorological congresses have uniformly recognized that either English or metric measure may be allowed, but that no other usage is to be encouraged. This is, however, merely a concession to the actual condition of affairs and does not represent any one's idea as to the uniformity that is most desirable.

In France, Germany, and Russia the metric system has been adopted both in the laboratory and at the observing stations, and the proverbial intellectual energy of the European students pushes them forward to great undertakings and profound investigations, in which laboratory experiment goes hand in hand with the observer's field work. In the United States and Canada our citizens are so accustomed to quickly adapt themselves to new conditions that a change from the English to the metric system should very soon become domiciled among us. Inasmuch as American physicists have united with the British and Continental physicists in the almost exclusive use of the metric system, it is becoming annually more and more imperative that the meteorologists of this country should follow suit. This is not altogether a question of sentiment or convenience. Meteorology is, strictly speaking, the physics of the atmosphere. The laws that govern atmospheric phenomena must be determined by experimental and mathematical work into which there enter many physical data whose exact values have been determined and are easily stated in metric units. The relations of these units among themselves is extremely simple in the metric system, but awkward and complex in the English system. Everything that can be done to simplify the difficulties that attend the study of meteorology should be done in order that we may induce the physicists and mathematicians to come to our help. The observer must concede something to the student.

In very many respects it is found to be to the advantage of manufacturers and importers and merchants generally to familiarize themselves with and even to adopt metric measures. All civilized governments have, therefore, legalized the use of the metric system as optional, while many of them make it obligatory. The Imperial Bureau of Standards near Berlin has lately declined to give certificates to any thermometers graduated on the Reamur scale, although this is as popular in Germany and Russia as the Fahrenheit is in England and America. It is the manufacturers who foster the popular demand for a variety of antique and objectionable apparatus, and it is the conservatism of human nature or the want of intellectual energy that leads us to prefer that which we have been so long accustomed to. Modern civilization frequently finds advantage in introducing new ideas, new apparatus, and better methods, and we have no doubt but that the use of the English mile, yard, foot, and inch, or the pound, ounce, dram, and grain will eventually be confined to the land surveyor, the farmer, and the market men, while everything that has an aspect of extreme accuracy or scientific relationships, including the daily weather bulletins, will be expressed in the metric system. Probably even now it would be a convenience to one-third of the citizens of the United States if the Daily Map and MONTHLY WEATHER REVIEW were to exhibit our fundamental observational data in both systems of measurement. In fact, the regret has often been expressed that the Weather Bureau did not foresee the change that is bound to come in the future and begin its career by the introduction of the metric system.

THE STRUCTURE AND FORMATION OF HAIL.

In the Vienna Sitzungsbericht, February, 1900, just received at the Weather Bureau, Dr. P. Czermak details some experiments on the cooling of water below its freezing point and the forms that result when it suddenly freezes. He concludes that not only can water, cooled below freezing, form a cloudy kernel of mixed ice and rain, but also water that has not been thus subcooled, and that, too, in a very deceptive manner; in many cases the opaque grains or nuclei of hailstones must have been formed of water that was not cooled below zero, centigrade, before it froze. Similar remarks apply to crystals of snow which may, therefore, have been formed at the freezing temperature without requiring any previous cooling to lower temperatures. Undoubtedly some hailstones are formed without these opaque nuclei.

HANN'S NEW METEOROLOGY.

Those of our readers who are familiar with the German language will be pleased to know that the first number of the new Lehrbuch der Meteorologie, by Prof. Dr. Julius Hann, has been received. The whole work will include about eight parts or 700 pages royal octavo. The principal text, in large type, is accompanied by almost as much matter in smaller type, and again as much more by way of foot notes in still smaller type. The appendix will consist of chapters in mathematical physics explanatory of the problems whose general results are given in the text. The whole volume consists of five subdivisions on temperature, pressure, aqueous vapor, the winds, and the atmospheric disturbances. On every page one sees evidence that the author has determined to present only the latest or best established views, and especially the results of accurate measurements instead of indefinite general views. The work represents the present state of scientific meteorology as contrasted with the popular and more readable books that have been published for general use. The price of the whole volume will be about $6. If there is a sufficient demand for an English translation, we believe that the Chief of Bureau will be pleased to provide it, although it may include only a portion of the present work.

THE RELATIVE DURATION OF THE NORMAL WARM AND COLD SEASONS.

The agriculturist understands by the term growing season the interval between the date of the sprouting of his recently sown seed and the date of the ripening of the harvest. The botanist understands by the growing season the interval between the appearance of the earliest buds or flowers in the springtime and the fall of the leaf in autumn. Both of these phenological periods depend quite as much on moisture as they do on temperature: not only must the temperature be above freezing, and in fact generally above 42° F., but there must be enough moisture in the soil to supply the sap necessary for growth. Linnsser has demonstrated that as we proceed eastward from the coast of Europe into the dry region of southern Russia, the plants have, by the process of natural selection, eliminated from among themselves those that can not adapt themselves to their surroundings, so that in southern Russia the early spring with its showers brings forth a fine crop of cereals and other plants, which very rapidly perfect their seeds so that the harvest is over before the long summer drought begins. A similar process of adaptation will undoubtedly go on as Americans continue the cultivation of the plains on the eastern slope of the Rocky Mountains in Mexico, the United States, and Canada. Already the development of "short season" wheat and corn is noticeable. We are, therefore, interested in the relations between the warm and cold portions of the year brought out by Mr. Pennywitt in his article on a previous page, and shown on Charts XI to XIII.

The mean daily temperatures employed by Mr. Pennywitt are the means of the daily maxima and minima. Now the maximum temperatures are the resultant of the sun's heat plus the effect of the winds, the clouds, and the radiation from the earth's surface, but the minimum temperatures are mainly the result of the radiation, the winds and the clouds, with but very little of the direct influence of sunshine. Therefore, as the maximum temperatures might be expected to show the influence of the progress of the sun northward in the springtime, or southward in the autumn, much more clearly than the daily minimum temperatures, so also the daily average of the maxima and minima should show this progress less clearly. Charts of the dates on which the normal daily maxima equal the normal annual mean of the maxima would be especially interesting from an agricultural point of view, since most plants depend for their growth and ripening on the direct action of the sun's rays.

Charts showing when the normal mean daily temperatures cross the line of 42° F. would be of special interest because the latter temperature has been taken as the basis for computing the sum total of the degrees usually adopted as a thermal constant in phenological studies.

THE WEATHER IN DISTANT REGIONS.

During the month of February special phenomena were reported about as follows:

February 3–6.—Severe gales off the coast of Virginia and North Carolina and very heavy weather between New York and Bermuda, as well as Halifax and Bermuda.

February 16, 17.—Intense cold in southern Europe, with high winds, snowstorms, and blizzards; an eruption of Mount Vesuvius; interruption of railroad traffic in southern Russia; heavy gale on the southern coast of Spain; snow slides in Switzerland.

February 1–19.—Remarkable easterly gales for fifteen days on the route between Norfolk, Va., and Queenstown, Ireland.

February 22, 23, 24.—Southern Russia, violent blizzard following a week of snowstorms; great hardships and prospects of a famine owing to the consumption of grain stored up for spring seed. The snowstorms of February 10–15 are reported to have been the fiercest known in forty years.

February 26.—2 a. m., at St. Joseph, Mich., earthquake; three distinct shocks.

February 27, 28.—Dull, unsettled weather in England, Germany, and France, with local rain.

NEW DETERMINATION OF VAPOR TENSION.

According to No. 2 of the Beiblätter for 1901, some new determinations of the vapor tension of saturated aqueous vapor have been made by Dr. Thiesen and K. Scheel and published in volume 3 of the Scientific Memoirs of the Imperial Physical and Technical Institute at Charlottenburg. The adopted value of the vapor pressure at 0° C. is 4.579 millimeters of mercury at 0° C. under normal gravity, with a probable error of ±0.001. For other temperatures the following pressures are found, but with a slightly lower degree of accuracy. These values must be considered as more reliable than the determinations by Regnault and Magnus at the same temperatures:

Temperature. °C.	Pressure. Thiesen and Scheel. *Mm.*
−11.334	1.9217
− 6.561	2.6731
0.0	4.579
+14.5679	12.4385
15.0593	12.8285
16.3603	13.9189
19.8402	17.3622
19.8438	17.3411
24.9749	23.6818
+25.4748	24.3308

The comparison of these values with the empirical formulæ for fluid water and for ice published in Wiedemann's Annalen, Vol. LXVII, page 692, 1899, shows no deviation exceeding $\frac{1}{10}$ millimeter. A translation of this article by Dr. Thiesen was prepared at the time for the MONTHLY WEATHER REVIEW, but the publication has been delayed.

The determinations of the vapor pressure from ice and

water at temperatures below freezing, as made by Marvin and Juhlin in 1891, can hardly be considered as supplanted by these two accurate measurements at —6° and —11° C.

The four decimal places given in the preceding table must not be allowed to produce a false impression as to the absolute accuracy of these figures. We grant that every generation of physicists undoubtedly improves upon the work of its predecessors, and the average accuracy of modern work undoubtedly exceeds that of a hundred years ago in physics as in astronomy; nevertheless, just as the astronomers are continually reverting to the work of Bradley at Greenwich as still being worth combining with the modern measurements, so it seems to us likely that the old determinations of vapor pressure by the physicists may also still be worth combining with the newest values. In every effort at extreme accuracy we find the observer himself enters as a source of disturbance. The accuracy of his eye, the delicacy of his touch, the weight and temperature of his body, his method of handling the apparatus, his nervousness or equanimity, his thoroughness or carelessness, his experience and his knowledge, all come into consideration. After ten good men have each done their best the results are usually combined together into one adopted value by giving to each man's work a weight that expresses approximately our reliance in him individually. The method of least squares not only tells us how to combine observations together, but also how to calculate the average discrepancy of the individual results and the weight that should be given to the final results. This weight is usually expressed as a "probable error," by which we mean that the different measurements harmonize among themselves so well that, unless there be some unknown source of error, the chances are that the given result is correct within a certain limit, but this "probable error" tells us absolutely nothing about the systematic sources of error that the observer may not have thought of. In the above case Drs. Thiesen and Scheel calculate the probable error of the vapor tension at 0° C. to be ±0.001, in other words, so far as they can see, there is an even chance that the vapor tension is somewhere between 4.578 and 4.580. Now, Broch in his reduction of Regnault's observations gives twelve independent determinations of this same vapor pressure at 0° C., viz:

4.680	4.671	4.563	4.544
.651	.591	.527	.685
.571	.611	.540	.658

Each of these is an independent value, sometimes the mean of several. They were determined on different days through a course of several months' work, and with several pieces of apparatus, so that many sources of error may have entered in an irregular way. If we take the simple mean of these values, i. e., 4.6077, and calculate the probable error, we get ±0.0114, in other words there is an even chance that the vapor pressure at 0° C. lies between 4.596 and 4.619. Similarly, Professor Marvin's value has the probable error, ±0.004. The value of the vapor tension over water and over ice must be a more difficult question than would be supposed at first thought, since eminent authorities differ so much from each other, even at the freezing point, where the uncertainty in the value must be much less than the intrinsic uncertainties for higher and lower temperatures where the errors of thermometry are superadded to all the others. As we have not the full memoir of Thiesen and Scheel at hand, and know not the special precautions taken by them in their work, we can, perhaps, best arrive at some idea of our present knowledge of this subject by comparing, side by side, the values of the vapor pressure at 0° C. as given by a number of authorities, as in the following table, where all are supposed to be expressed in millimeters of mercury at 0° C., and under standard gravity.

	Millimeters.	Probable error.
Regnault, observations	4.6077	±0.011
Broch, formula	4.5687	.....
Magnus, observations	4.525	.....
Thiesen, observations	4.579	±0.001
Marvin, observations	4.568	±0.004
Juhlin, water	4.62	.....
Juhlin, ice	4.60	.....

The discordance between these numbers ought to be explained by further investigation into the effects of sources of error that have not yet been recognized, before we can confidently throw aside all previous determinations, and adopt the newest one by the Imperial Institute at Charlottenburg. The fact that there is a range of 0.10 millimeter between the values of vapor tension by different authorities at 0° C. forces one to recognize that even larger discrepancies may be expected at higher and lower temperatures, so that there may be an uncertainty of 1/10 millimeter in our best tables, instead of an accuracy of 1/1000 millimeter, as indicated by the simple "probable error" of the method of least squares, which in fact really ought to be called simply the index to the general variability of any system of measurements.

We have, therefore, computed the exact vapor pressures given by Broch's tables,[1] corresponding to the temperatures of Dr. Thiesen's observations as given, and we have inserted these in the following table for the edification of our readers.

Temperatures.	Vapor pressures.		Difference, Thiesen-Broch.
	Thiesen and Scheel.	Broch.	
°C.	*Mm.*	*Mm.*	*Mm.*
−11.334	1.9217	1.9360	−0.0143
− 6.561	2.6731	2.8081	−0.1350
0.0	4.579	4.5687	+0.010
+14.5679	12.4385	12.3269	+0.1116
15.0593	12.8285	12.7222	+0.1063
16.3603	13.9189	13.8234	+0.0965
19.8402	17.3622	17.1925	+0.1697
19.8438	17.3411	17.1965	+0.1446
24.9749	23.6818	23.4823	+0.1995
+25.4748	24.3306	24.1911	+0.1397

We take some satisfaction in adding that the value given by Thiesen, 4.579[mm], and that given by Marvin, 4.568[mm], are, in fact, in almost as close agreement with each other as would be required by their probable errors, which latter would justify a discrepancy of 0.005. They are the results of the latest and most painstaking work, and their agreement encourages us to believe that there are but very few and slight causes of error that have not been allowed for by them. Unfortunately the Beiblätter (from which we have necessarily copied the results of Thiesen's measurements) says nothing about the question of the tension of vapor over ice and over water at the temperatures —6° and —11° C. For these temperatures the tensions given by Thiesen are appreciably higher than those given by Marvin for ice, but agree better with his figures for water. On the whole, therefore, the new psychrometric tables of the Weather Bureau (W. B., No. 235) represent our best knowledge of the vapor tensions over water and ice.

[1] In the first volume of the "Travaux" of the International Bureau at Paris.

THE WEATHER OF THE MONTH.

By ALFRED J. HENRY, Professor of Meteorology.

CHARACTERISTICS OF THE WEATHER FOR FEBRUARY.

The weather of February, 1901, was characterized by low temperatures, great dryness over New England, the Middle States, and the Ohio Valley, high gales along the New England and middle Atlantic coasts, and the absence of severe snowstorms and cold waves.

A remarkable feature of the month was the persistence of an area of low pressure over New England and the North Atlantic.

PRESSURE.

The distribution of monthly mean pressure is graphically shown on Chart IV and the numerical values are given in Tables I and VI.

During the opening days of the month a number of lows appeared in the southwest, but with few exceptions they failed to reach New England as vigorous storms. From the 12th until the end of the month a few lows appeared north of Montana, but in no case did they reach the St. Lawrence Valley as storms of even moderate energy. From the 4th until the close of the month pressure was abnormally low over New England and the North Atlantic, the center of the depression appearing to oscillate back and forth in the neighborhood of Newfoundland. Monthly mean pressure at St. Johns was over half an inch below the normal; at Boston, 0.28 inch; New York, 0.22 inch, and Buffalo, 0.07 inch. Mean pressure from the Mississippi Valley westward was generally in excess of the normal by amounts ranging from 0.01 inch in eastern Oregon to a maximum of 0.13 inch in Wyoming. Not within the last thirty years has monthly mean pressure been so low over New England.

TEMPERATURE OF THE AIR.

The distribution of monthly mean surface temperature, as deduced from the records of about 1,000 stations, is shown on Chart VI.

Over the greater portion of the country temperature was markedly below the normal for the season. The region of greatest continuous cold was in the lower Lake region and in the upper Ohio Valley. While there were no marked cold waves, yet temperature was almost continuously below the seasonal average in the eastern parts of the country and from the Platte River in Nebraska southward to the Gulf. In the Northwest and generally west of the Rocky Mountains, temperature was above the seasonal average by amounts varying from 2° to 5° daily. Maximum temperatures of 90° were registered in the Rio Grande Valley, and of 80° and over in southern Florida, southern Louisiana, and quite generally throughout Texas, southwestern Arizona, and southern California. In the Lake region, also in northern New England and in northern Pennsylvania, the maximum temperature did not rise as high as 40° at any time during the month. Freezing temperatures were experienced in northern and central Florida and to the Gulf coast in Alabama and Mississippi. The lowest temperatures of the month were registered in Minnesota.

The average temperature for the several geographic districts and the departures from the normal values are shown in the following table:

Average temperatures and departures from the normal.

Districts.	Number of stations.	Average temperatures for the current month.	Departures for the current month.	Accumulated departures since January 1.	Average departures since January 1.
		°	°	°	°
New England	10	21.6	− 4.7	− 5.0	− 2.5
Middle Atlantic	12	28.0	− 6.5	− 5.4	− 2.7
South Atlantic	10	43.4	− 6.1	− 6.1	− 3.0
Florida Peninsula	7	57.8	− 5.3	− 5.8	− 2.9
East Gulf	7	49.0	− 5.5	− 4.1	− 2.0
West Gulf	7	48.9	− 2.6	+ 3.3	+ 1.6
Ohio Valley and Tennessee	12	31.0	− 7.1	− 5.3	− 2.6
Lower Lake	8	18.2	− 8.3	− 7.2	− 3.6
Upper Lake	9	14.5	− 4.6	− 1.7	− 0.8
North Dakota	8	8.4	+ 0.3	+ 6.8	+ 3.4
Upper Mississippi Valley	11	20.4	− 5.6	+ 0.6	+ 0.3
Missouri Valley	10	22.7	− 1.6	+ 7.4	+ 3.7
Northern Slope	7	19.3	− 1.7	+ 5.6	+ 2.8
Middle Slope	6	29.9	− 2.5	+ 2.9	+ 1.4
Southern Slope	6	38.9	− 2.3	+ 2.9	+ 1.4
Southern Plateau	15	42.0	+ 1.0	+ 9.1	+ 4.6
Middle Plateau	9	31.6	+ 2.8	+ 8.5	+ 4.2
Northern Plateau	10	30.5	+ 1.6	+ 5.6	+ 2.8
North Pacific	9	42.0	+ 1.4	+ 1.8	+ 0.9
Middle Pacific	5	50.4	+ 1.2	+ 1.5	+ 0.8
South Pacific	4	55.6	+ 2.1	+ 4.3	+ 2.2

In Canada.—Prof. R. F. Stupart says:

The mean temperature was below the average throughout Ontario, the more southern parts of the Province showing the largest departures, which were from 5° to 7°. In western Quebec the temperature was likewise below average, but in all other parts of the Dominion it was above average, and particularly so in eastern Nova Scotia and in Saskatchewan and northern Alberta. A positive departure of 7° was recorded at Sydney, N. S., 7° at Prince Albert, and 8° at Edmonton. In Manitoba and the Territories there were several fairly pronounced cold spells, but no temperature lower than —30° has been reported. In Ontario the steady cold weather was the chief characteristic of the month, but no unusually low temperature occurred except in the more northern districts from Nipissing westward to Port Arthur. In Quebec and the Maritime Provinces the month was characterized more especially by two cold, blustery periods, the first between the 5th and 7th and the second between the 12th and 14th.

PRECIPITATION.

The month was essentially one of light rainfall, except in southern Louisiana and along the Georgia and South Carolina coasts. Another notable exception may be found in Arizona and southern California, where the rains during the first part of the month were exceedingly heavy for that section. The total rainfall at Yuma was 3.01 inches, an amount nearly as large as the combined rainfall of the last three years. Rainfall was above the seasonal normal quite generally throughout the western Plateau region and along the north Pacific coast.

The snowfall of the month was not uniformly distributed. In some regions, as in Arizona, southern and central Utah, southern California, and the Adirondack region, including western New York, there was more snow than usual. Reports from Arizona show that the fall in that territory was greater than the combined snowfall of the two previous years. A heavy fall of snow was experienced in the Gulf and South Atlantic States on the night of the 22d and during the 23d. The snow was accompanied by high northwest winds and low temperatures, but nevertheless it remained on the ground but a short time. In the upper Missouri Valley, the Northwest, New England, and the southern and eastern portions of the Middle States the month was remarkably free from snow.

At the end of the month there was a covering of snow on the ground in northern New England and thence westward

through New York and northern Pennsylvania to Minnesota and eastern Iowa.

The distribution of snowfall is shown by Chart IX, and the amount on the ground at the end of the month by Chart X.

Average precipitation and departure from the normal.

Districts.	Number of stations.	Average.		Departure.	
		Current month.	Percentage of normal.	Current month.	Accumulated since Jan. 1.
		Inches.		*Inches.*	*Inches.*
New England	10	1.00	28	−2.6	−4.2
Middle Atlantic	12	0.82	25	−2.5	−3.7
South Atlantic	10	3.44	95	−0.2	−1.6
Florida Peninsula	7	3.11	100	0.0	−0.3
East Gulf	7	4.72	102	+0.1	−0.5
West Gulf	7	1.79	53	−1.6	−3.4
Ohio Valley and Tennessee	12	1.25	29	−3.0	−4.8
Lower Lake	8	1.85	67	−0.9	−1.5
Upper Lake	9	1.02	53	−0.9	−1.7
North Dakota	8	0.45	69	−0.2	−0.5
Upper Mississippi Valley	11	1.10	58	−0.8	−1.4
Missouri Valley	10	1.00	83	−0.2	−0.8
Northern Slope	7	0.62	100	0.0	−0.4
Middle Slope	6	0.68	77	−0.2	−0.8
Southern Slope	6	0.90	100	0.0	−0.8
Southern Plateau	15	2.66	251	+1.6	+1.6
Middle Plateau	9	2.01	153	+0.7	+0.3
Northern Plateau	10	1.75	113	+0.2	−0.2
North Pacific	9	6.71	110	+0.6	+0.5
Middle Pacific	5	6.06	149	+2.0	+3.0
South Pacific	4	4.35	164	+1.7	+3.5

In Canada.—Professor Stupart says:

The precipitation did not differ greatly from average near the Pacific coast and was chiefly in the form of rain, although several days of snow occurred in all localities. In the Northwest Territories and Manitoba the snowfall was very generally a little greater than average and except in southern Alberta sleighing was good throughout the month. Near the western shores of Lake Huron and the Georgian Bay from 30 to 40 inches of snow fell, and at some points near the eastern end of Lake Erie there was also a heavy snowfall, but over the larger portion of Ontario, throughout Quebec and also in the Maritime Provinces, exclusive of eastern Nova Scotia, the precipitation was considerably less than average and was wholly in the form of snow. In Cape Breton, however, there were several days of rain, and also several heavy snowstorms.

At the close of the month the valleys and lower levels in Vancouver Island, and the mainland of British Columbia, were bare of snow, as were also the prairies of southern Alberta and western Assiniboia, but all other parts of the Dominion were snow covered. Stations in western Manitoba and the Qu'Appelle Valley report from 20 to 40 inches on the level. In Ontario the depth is nearly 3 feet on the western slope toward the Georgian Bay and Lake Huron; in eastern Ontario and western Quebec the depth is about two and a half feet, and a depth of three feet or over is very general in eastern Quebec and the interior of New Brunswick.

SLEET.

The following are the dates on which sleet fell in the respective States:

Alabama, 6, 7, 11, 23. Arizona, 1, 2, 5, 6, 7, 9. Arkansas, 6, 7, 9, 10, 11, 12, 22, 26. California, 1, 2, 3, 5, 6, 7, 8, 10, 23. Colorado, 7, 17, 18, 19, 21. Connecticut, 4. Delaware, 9. District of Columbia, 9. Georgia, 2, 7, 23, 25, 26. Idaho, 14, 16. Illinois, 1, 2, 3, 4, 7, 8, 11, 17, 28. Indiana, 3, 8, 9, 11, 17, 28. Indian Territory, 1, 6, 7, 10. Iowa, 2, 8, 11, 16, 17, 25, 28. Kansas, 2, 6, 7, 8. Kentucky, 2, 17. Louisiana, 6, 22, 23. Maine, 4. Maryland, 3, 4, 8, 9, 10. Massachusetts, 9, 10, 11, 12, 23, 24. Michigan, 17. Minnesota, 17, 28. Mississippi, 6, 13, 21, 22, 23, 27. Missouri, 1, 2, 3, 7, 8, 11, 14, 21, 28. Montana, 16, 19. Nebraska, 6, 7, 22, 28. Nevada, 4, 17, 19, 23, 24, 26. New Jersey, 3, 4, 9. New Mexico, 2, 5, 7, 8, 9, 11. New York, 4, 15. North Carolina, 3, 7, 8, 11, 23, 26. North Dakota, 16, 27. Ohio, 3, 4, 8, 9, 17. Oklahoma, 10. Oregon, 1, 2, 16, 17, 19. Pennsylvania, 3, 4, 9. Rhode Island, 4. South Carolina, 3, 7, 23, 24, 25, 26. South Dakota, 16, 17, 24, 25. Tennessee, 6, 10, 17. Texas, 3, 5, 10, 11, 12, 21, 22, 23. Utah, 2, 3, 4, 6, 17, 18, 19, 22, 24, 25. Virginia, 3, 8, 9. Washington, 15, 16, 17, 18, 19, 22, 23, 24. West Virginia, 4, 9. Wisconsin, 17. Wyoming, 7, 16, 25, 26, 27.

HAIL.

The following are the dates on which hail fell in the respective States:

Arizona, 1, 2, 6, 7, 11, 24. Arkansas, 10. California, 1, 5, 8, 23. Florida, 19. Illinois, 3. Indiana, 3. Indian Territory, 2, 3. Kansas, 25. Kentucky, 2, 3, 7, 11, 17, 22. New Mexico, 24. Oregon, 1, 2, 7, 16, 17, 18, 22. Texas, 2, 3, 22, 28.

HUMIDITY.

The averages by districts appear in the subjoined table:

Average relative humidity and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
	%			%	
New England	65	−10	Missouri Valley	75	− 2
Middle Atlantic	66	− 8	Northern Slope	78	+ 9
South Atlantic	67	−11	Middle Slope	72	+ 6
Florida Peninsula	75	− 7	Southern Slope	70	0
East Gulf	68	−10	Southern Plateau	56	+ 8
West Gulf	75	+ 2	Middle Plateau	76	+14
Ohio Valley and Tennessee	73	− 1	Northern Plateau	79	+ 1
Lower Lake	80	0	North Pacific Coast	78	− 7
Upper Lake	82	+ 1	Middle Pacific Coast	80	+ 4
North Dakota	79	− 2	South Pacific Coast	74	+ 3
Upper Mississippi	78	+ 1			

SUNSHINE AND CLOUDINESS.

The distribution of sunshine is graphically shown on Chart VII, and the numerical values of average daylight cloudiness, both for individual stations and by geographical districts, appear in Table I.

The averages for the various districts, with departures from the normal, are shown in the table below:

Average cloudiness and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
New England	4.4	−1.1	Missouri Valley	4.6	−0.8
Middle Atlantic	4.5	−1.1	Northern Slope	4.9	+0.1
South Atlantic	4.3	−1.0	Middle Slope	5.2	+0.8
Florida Peninsula	4.1	−0.5	Southern Slope	5.4	+0.6
East Gulf	5.5	0.0	Southern Plateau	3.8	+0.8
West Gulf	6.2	+0.4	Middle Plateau	6.8	+2 0
Ohio Valley and Tennessee	5 8	−0.4	Northern Plateau	6.4	−0.3
Lower Lake	7.3	+0.5	North Pacific Coast	6.3	−0.7
Upper Lake	5.8	−0.5	Middle Pacific Coast	6.2	+1 4
North Dakota	4.0	−1.1	South Pacific Coast	4.6	+0.5
Upper Mississippi	4.3	−1.0			

WIND.

The maximum wind velocity at each Weather Bureau station for a period of five minutes is given in Table I, which also gives the altitude of Weather Bureau anemometers above ground.

Following are the velocities of 50 miles and over per hour registered during the month:

Maximum wind velocities.

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
Atlantic City, N. J.	5	55	nw.	Mount Tamalpais, Cal.	17	56	nw.
Block Island, R. I.	5	59	nw.	New York, N. Y.	4	52	nw.
Do.	6	59	nw	Do.	5	70	nw.
Do.	7	50	nw.	Do.	6	64	nw.
Do.	10	54	nw.	Do.	10	50	nw.
Do.	13	58	nw.	Do.	12	52	nw.
Cape Henry, Va.	12	66	n.	Do.	13	67	nw.
Do.	13	52	nw.	Do.	14	52	nw.
Do.	20	54	n.	Do.	15	50	nw.
Cheyenne, Wyo.	16	54	nw.	Do.	17	52	nw.
Chicago, Ill.	3	58	ne.	Valentine, Nebr.	17	54	nw.
El Paso, Tex.	22	50	nw.	Williston, N. Dak.	17	60	nw.
Hatteras, N. C.	13	50	nw.				

ATMOSPHERIC ELECTRICITY.

Numerical statistics relative to auroras and thunderstorms are given in Table IV, which shows the number of stations from which meteorological reports were received, and the number of such stations reporting thunderstorms (T) and auroras (A) in each State and on each day of the month, respectively.

Thunderstorms.—Reports of 357 thunderstorms were received during the current month as against 705 in 1900 and 210 during the preceding month.

The dates on which the number of reports of thunderstorms for the whole country were most numerous were: 3d, 99; 28th, 42; 2d, 35.

Reports were most numerous from: California, 47; Florida, 34; Louisiana, 31.

Auroras.—The evenings on which bright moonlight must have interfered with observations of faint auroras are assumed to be the four preceding and following the date of full moon, viz: January 31 to February 7, 1901.

In Canada.—Auroras were reported as follows: Parry Sound, 13th, 16th; Minnedosa, 10th, 12th, 20th, 27th; Swift Current, 19th.

DESCRIPTION OF TABLES AND CHARTS.

By ALFRED J. HENRY, Professor of Meteorology.

Table I gives, for about 145 Weather Bureau stations making two observations daily and for about 25 others making only one observation, the data ordinarily needed for climatological studies, viz, the monthly mean pressure, the monthly means and extremes of temperature, the average conditions as to moisture, cloudiness, movement of the wind, and the departures from normals in the case of pressure, temperature, and precipitation, the total depth of snowfall, and the mean wet-bulb temperatures. The altitudes of the instruments above ground are also given.

Table II gives, for about 2,700 stations occupied by voluntary observers, the highest maximum and the lowest minimum temperatures, the mean temperature deduced from the average of all the daily maxima and minima, or other readings, as indicated by the numeral following the name of the station; the total monthly precipitation, and the total depth in inches of any snow that may have fallen. When the spaces in the snow column are left blank it indicates that no snow has fallen, but when it is possible that there may have been snow of which no record has been made, that fact is indicated by leaders, thus (. . . .).

Table III gives, for all stations that make observations at 8 a. m. and 8 p. m., the four component directions and the resultant directions based on these two observations only and without considering the velocity of the wind The total movement for the whole month, as read from the dial of the Robinson anemometer, is given for each station in Table I. By adding the four components for the stations comprised in any geographical division the average resultant direction for that division can be obtained.

Table IV gives the total number of stations in each State from which meteorological reports of any kind have been received, and the number of such stations reporting thunderstorms (T) and auroras (A) on each day of the current month.

Table V gives a record of rains whose intensity at some period of the storm's continuance equaled or exceeded the following rates:

Duration, minutes..	5	10	15	20	25	30	35	40	45	50	60	80	100	120
Rates pr. hr. (ins.)..	3.00	1.80	1.40	1.20	1.08	1.00	0.94	0.90	0.86	0.84	0.75	0.60	0.54	0.50

In the northern part of the United States, especially in the colder months of the year, rains of the intensities shown in the above table seldom occur. In all cases where no storm of sufficient intensity to entitle it to a place in the full table has occurred, the greatest rainfall of any single storm has been given, also the greatest hourly fall during that storm.

Table VI gives, for about 30 stations furnished by the Canadian Meteorological Service, Prof. R. F. Stupart, director, the means of pressure and temperature, total precipitation and depth of snowfall, and the respective departures from normal values, except in the case of snowfall.

Table VII gives the heights of rivers referred to zeros of gages.

NOTES EXPLANATORY OF THE CHARTS.

Chart I, tracks of centers of high areas, and Chart II, tracks of centers of low areas, are constructed in the same way. The roman numerals show number and chronological order of highs (Chart I) and lows (Chart II). The figures within the circles show the days of the month; the letters *a* and *p* indicate, respectively, the 8 a. m. and 8 p. m., seventy-fifth meridian time, observations. Within each circle is also given (Chart I) the highest barometric reading and (Chart II) the lowest pressure at or near the center at that time.

Chart III.—Total precipitation. The scale of shades showing the depth of rainfall is given on the chart itself. For isolated stations the rainfall is given in inches and tenths, when appreciable; otherwise, a "trace" is indicated by a capital T, and no rain at all, by 0.0.

Chart IV.—Sea-level pressure, temperature, and resultant surface winds. The wind directions on this Chart are the computed resultants of observations at 8 a. m. and 8 p. m., daily; the resultant duration is shown by figures attached to each arrow. The temperatures are the means of daily maxima and minima and are reduced to sea level. The pressures are the means of 8 a. m. and 8 p. m. observations, daily, and are reduced to sea level and to standard gravity. The reduction for 30 inches of the mercurial barometer, as formerly shown by the marginal figures for each degree of latitude, has already been applied.

Chart V.—Hydrographs for seven principal rivers of the United States.

Chart VI.—Surface temperatures; maximum, minimum, and mean. Lines of equal monthly mean temperature in

red; lines of equal maximum temperature in black; and lines of equal minimum temperature (dotted) also in black.

Chart VII.—Percentage of sunshine. The average cloudiness at each Weather Bureau station is determined by numerous personal observations during the day. The difference between the observed cloudiness and 100, it is assumed, represents the percentage of sunshine, and the values thus obtained have been used in preparing Chart VII.

Chart VIII.—West Indian monthly isobars, isotherms, and resultant winds.

Chart IX.—Total snowfall.

Chart X.—Depth of snow on ground at close of month.

TABLE 1.—*Climatological data for Weather Bureau Stations, February, 1901.*

Stations.	Elevation of instruments.			Pressure, in inches.			Temperature of the air, in degrees Fahrenheit.										Mean wet thermometer.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches.			Wind.				Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness, tenths.	Total snowfall.
	Barometer above sea level, feet.	Thermometers above ground.	Anemometer above ground.	Mean actual, 8 a. m. + 8 p. m. ÷ 2.	Mean reduced.	Departure from normal.	Mean max. + mean min. ÷ 2.	Departure from normal.	Maximum.	Date.	Mean maximum.	Minimum.	Date.	Mean minimum.	Greatest daily range.					Total.	Departure from normal.	Days with .01, or more.	Total movement, miles.	Prevailing direction.	Maximum velocity. Miles per hour.	Maximum velocity. Direction.	Maximum velocity. Date.					
New England.							21.6	— 4.7											63										4.4	
Eastport	76	69	74	29.50	29.59	— .37	19.3	— 2.7	40	18	26	5	8	13	17	17	13	76	1.65	— 1.0	9	9,276	nw.	38	ne.	24	11	5	12	6.0	16.5
Portland, Me	108	81	117	29.57	29.68	— .33	20.2	— 4.4	40	26	28	5	9	12	24	16	8	63	1.68	— 1.8	7	6,735	nw.	35	nw.	13	11	6	4.3	16.8
Northfield	876	15	65	28.82	29.84	— .22	11.7	— 4.3	34	26	19	—13	3	4	33	9	4	72	0.18	— 1.9	6	8,004	n.	48	nw.	13	4	10	14	6.6	2.3
Boston	135	115	181	29.62	29.76	— .28	24.2	— 3.8	47	26	31	10	7	17	24	20	11	61	0.66	— 2.8	5	10,456	w.	43	nw.	5	15	7	6	4.2	8 8
Nantucket	12	43	85	29.75	29.76	— .28	25.4	— 5.6	38	19	30	11	14	21	23	22	13	60	1.33	— 1.6	10	12,595	nw.	48	nw.	7	14	5	9	4.8	11.5
Block Island	26	11	70	29.77	29.80	— .26	25.1	— 5.7	39	19	30	10	14	20	21	22	14	61	0.83	— 3.5	4	16,899	nw.	59	nw.	6	16	10	2	2.9	5.4
Narragansett	.....	10	....	.. ...	.....	.....	23.2	— 5.9	41	•	31	8	14	16	24				1.17	— 3.3	3	.....	w.	...	.....	...	26	0	2	.....	7.5
New Haven	106	117	140	29.72	29.84	— .24	23.8	— 5.0	41	16	31	8	14	17	21	19	12	62	0.54	— 3.6	6	7,553	nw.	37	nw.	13	21	4	3	2.2	5.5
Mid. Atlan. States.							23.0	— 6.5											66										4.5	
Albany	97	84	113	29.78	29.90	— .17	19.2	— 5.0	40	26	26	0	3	12	27	16	11	72	0.56	— 2.1	2	6,338	w.	32	w.	13	12	10	6	4.6	4.2
Binghamton	875	79	90	.....	.....	.....	17.0	— 6.9	37	16	24	— 8	24	10	31	....	....	....	1.09	— 1.8	11	6,044	nw.	31	n.	13	5	13	10	5.8	11.1
New York	314	108	350	29.54	29.89	— .22	25.6	— 5.9	42	26	31	12	13	20	19	21	13	60	0.86	— 2.9	4	15,173	nw.	70	nw.	5	14	10	4	4.0	5.8
Harrisburg	374	94	104	.....	.....	.....	25.3	— 7.2	43	16	31	11	23	19	19	....	....	....	0.53	— 2.3	4	8,125	nw.	39	nw.	9	8	10	10	5.4	4.5
Philadelphia	117	168	184	29.82	29.95	— .17	27.2	— 6.3	46	16	34	12	14	20	22	23	17	66	0.86	— 2.3	4	8,646	nw.	42	nw.	5	14	4	10	4.6	2.4
Scranton	805	111	119	29.04	29.97	— .12	20.4	.....	38	16	27	2	24	14	22	18	16	89	1.34	.....	15	6,289	nw.	35	nw.	12	6	11	11	6.2	14.5
Atlantic City	52	68	76	29.88	29.94	— .14	27.8	— 6.1	49	16	35	13	24	21	24	24	17	68	0.94	— 2.4	6	10,169	nw.	55	nw.	5	12	11	5	4.4	2.4
Cape May	17	47	51	29.96	29.98	— .11	28.7	— 7.0	46	16	34	16	14	23	16	25	....	...	0.85	— 2.9	5	7,948	nw.	35	nw.	5	11	13	4	4.2	1.0
Baltimore	123	68	82	29.84	29.98	— .14	29.5	— 6.7	49	18	37	14	14	22	23	24	17	62	0.65	— 2.8	4	4,036	w.	22	sw.	24	12	12	4	4.3	2.1
Washington	112	59	76	29.88	30.01	— .11	29.8	— 6.0	57	16	38	13	2	22	35	24	14	55	0.62	— 2.8	4	6,972	nw.	38	nw.	5	13	9	6	3.9	0.2
Cape Henry	.....	5	33	.....	.....	.....	34.9	— 9.0	59	16	41	20	24	28	35	....	....	....	0.94	— 2.6	9	9,937	nw.	66	n.	12	13	8	7	4.6	4.0
Lynchburg	681	83	88	29.24	30.01	— .11	34.4	— 5.6	65	18	43	16	24	26	33	28	20	60	0.78	— 2.8	4	4,217	nw.	30	nw.	12	16	8	4	3.8	T.
Norfolk	91	102	111	29.90	30.00	— .12	36.0	— 6.8	60	16	43	16	24	29	27	31	24	65	1.15	— 2.7	7	6,962	nw.	37	nw.	5	17	6	5	3.6	6.1
Richmond	144	82	90	.....	.....	.....	34.7	... ...	62	16	44	18	1	26	36	....	....	....	0.55	.....	7	4,174	nw.	26	nw.	4	14	9	5	4.1	1.0
S. Atlantic States.							43.4	— 6.1											67										4.3	
Charlotte	773	68	76	29.18	30.04	— .08	39.8	— 5.2	71	18	49	17	24	30	25	33	24	58	1.96	— 2.6	6	5,155	sw.	28	nw.	22	13	8	7	4 0	1.0
Hatteras	11	17	36	29.98	29.99	— .11	39.5	— 7.1	63	4	45	22	24	34	21	36	34	77	2.35	— 2.1	9	10,799	nw.	50	nw.	13	18	3	7	3.6	1.0
Kittyhawk	8	12	30	.....	.....	.....	36.6	— 9.4	53	16	43	19	24	30	24	....	....	....	3.60	— 0.2	6	8,284	ne.	....	.....	...	17	2	9	4.1	3.0
Raleigh	376	93	101	29.63	30.04	— .08	38.8	— 5.1	72	18	48	13	24	29	30	32	24	61	1.48	— 2.3	6	4,922	nw.	28	nw.	4	17	6	5	3.4	2.5
Wilmington	78	82	90	29.95	30.04	— .07	42.4	— 7.4	72	18	51	18	24	34	24	35	29	67	3.21	— 0.0	8	5,677	nw.	35	w.	4	16	8	4	3.5	9.0
Charleston	48	14	92	30.02	30.07	— .05	47.5	— 5.3	76	18	55	23	24	40	24	41	35	69	3.58	+ 0.3	8	6,774	w.	28	nw.	20	11	9	8	4.5	1.1
Columbia	.....	5	....	.....	.....	.....	48.0	— 5.1	75	18	54	19	24	32	34	....	....	....	3.11	— 1.1	5	.....	nw.	....	....	...	9	11	8	5.2	6.3
Augusta	180	89	103	29.86	30.06	— .05	45.1	— 5.3	73	18	55	19	24	36	28	38	31	65	4.16	+ 0.2	6	4,509	nw.	27	w.	4	13	9	6	4.1	5.3
Savannah	65	79	89	29.99	30.06	— .08	49.0	— 5.3	75	18	58	26	24	40	24	42	36	68	4.21	+ 1.1	9	5,131	w.	24	sw.	3	11	10	7	4.4	T.
Jacksonville	43	69	84	30.02	30.07	— .04	52.4	— 6.0	75	9	61	29	24	44	24	46	41	72	6.76	+ 3.6	8	4,800	nw.	26	sw.	3	10	4	14	5.8	
Florida Peninsula.							63.1	— 4.0											75										4.1	
Jupiter	28	13	55	30.02	30.04	— .05	63.8	— 3.3	85	11	72	42	21	55	27	56	53	75	1.07	— 1.5	5	7,046	nw.	40	sw.	19	14	11	3	3.8	
Key West	22	43	50	30.06	30.05	— .02	67.4	— 4.0	81	11	72	52	25	63	19	62	59	78	0.47	— 1.2	4	7,649	ne.	48	w.	19	16	6	6	4.1	
Tampa	34	60	67	30.02	30.06	— .04	58.2	— 4.6	79	11	67	32	24	49	34	51	46	72	1.76	— 1.0	7	4,736	nw.	34	sw.	19	12	9	7	4.3	
East Gulf States.							49.0	— 5.5											68										5.5	
Atlanta	1,174	139	156	28.82	30.10	— .05	41.0	— 7.0	68	17	50	19	24	33	27	34	28	65	4.72	+ 0.1	8	9,116	nw.	43	nw.	20	9	11	8	5.3	4.4
Macon	370	93	99	.....	.....	.....	44.5	.....	69	17	54	18	24	35	31	....	....	....	4.04	— 0.6	8	4,923	nw.	30	nw.	20	11	13	4	4 1	4.0
Pensacola	56	78	90	.....	.....	.....	52.3	— 4.5	67	18	59	27	24	46	19	....	....	....	3.44	— 0.5	11	5,394	n.	30	n.	19	9	8	11	5.6	T.
Mobile	57	88	96	30.04	30.11	— .00	50.2	— 4.6	73	8	58	28	24	43	24	45	39	70	4.04	— 0.7	10	5,628	n.	31	nw.	23	11	6	11	5.8	0 2
Montgomery	223	100	112	29.86	30.11	— .02	46.4	— 6.3	71	17	53	21	24	38	32	40	34	68	3 80	— 1.4	8	4,614	n.	32	nw.	3	11	4	13	5 7	4.0
Meridian	375	84	93	.....	.....	.....	45.2	— 8.4	72	17	54	18	24	36	32	....	....	....	4.35	— 1.5	10	4,137	n.	22	nw.	3	9	6	13	6.1	8 3
Vicksburg	247	65	76	29.82	30.10	— .02	48.0	— 4.6	73	18	56	24	23	40	24	41	34	65	5.71	+ 1.1	10	4,911	ne.	42	nw.	3	8	6	14	6 1	3.2
New Orleans	51	88	121	30.03	30.09	+ .01	52.4	— 4.7	80	18	60	31	23	46	23	48	44	74	5.78	+ 1.2	11	6,604	n.	30	n.	23	12	5	11	5.0	T.
Port Eads	.....	27	...	.....	.....	.....	55.4	— 4.2	74	11	62	35	24	48	26	...	...	...	6.47	+ 3.2	13	.....	ne.	...	.....	...	6	8	14	....	
West Gulf States.							43.9	— 2.6											75										6.2	
Shreveport	249	77	84	29.84	30.11	+ .01	47.1	— 4.1	77	18	56	21	23	39	29	41	35	69	2.91	— 1.2	12	5,116	e.	28	n.	22	6	5	17	7.0	1.4
Fort Smith	457	79	94	29.62	30.13	+ .04	41.8	+ 0.3	70	17	52	20	23	32	33	35	30	71	0.78	— 2.8	8	6,196	nw.	44	w.	3	7	9	12	5.9	0.2
Little Rock	357	93	100	29.74	30.14	+ .03	41.4	— 4.0	71	17	50	22	24	33	32	37	32	73	1.71	— 3.6	8	5,641	nw.	30	nw.	3	5	13	10	6.4	0.1
Corpus Christi	18	42	50	30.04	30.06	— .01	56.5	— 2.5	74	3	63	33	23	50	26	52	49	80	1.33	— 1.1	10	7,921	n.	30	n.	22	9	4	15	6.0	
Fort Worth	670	106	114	29.38	30.12	+ .03	45.0	.....	80	17	55	16	23	35	35	38	32	69	1.59	.....	10	7,377	n.	36	w.	2	11	7	10	5.5	2.8
Galveston	54	106	112	30.00	30.05	— .02	54.6	— 2.4	73	18	60	34	23	49	29	52	50	87	2.24	— 0.8	9	9,210	se.	40	n.	22	5	9	14	6.8	
Palestine	510	73	79	29.55	30.11	+ .02	48.4	— 2.6	79	18	57	21	23	40	29	44	42	81	2.85	— 0.7	10	5,613	n.	25	ne.	22	8	7	13	6.2	2.0
San Antonio	701	67	77	29.33	30.09	+ .01	52.6	— 3.2	84	28	63	27	23	42	39	45	39	68	0.71	— 1.2	10	5,699	n.	36	n.	22	10	6	12	5.8	
Ohio Val. & Tenn.							31.0	— 7.1											73										5.3	
Chattanooga	762	106	112	29.29	30.14	+ .02	39.2	— 6.3	71	18	48	20	20	30	34	33	34	59	1.71	— 3.6	4	5,763	nw.	32	nw.	19	10	10	8	5.0	T.
Knoxville	1,004	10	88	29 01	30.12	— .01	36.4	— 5.9	70	18	46	17	21	27	36	30	24	68	0.79	— 4.5	4	6,080	sw.	33	w.	4	14	8	6	4.2	T.
Memphis	397	140	154	29.71	30.13	+ .03	41.6	— 3.2	72	17	49	21	23	34	24	36	31	69	1.95	— 3.4	6	7,203	nw.	48	w.	3	5	12	11	6.6	T.
Nashville	546	128	134	29.54	30.14	+ .02	37.0	— 5.7	70	17	46	16	23	28	34	31	24	64	1.60	— 3.7	7	5,056	nw.	35	se.	8	8	11	9	5.5	0.8
Lexington	989	75	102	.....	.....	.....	29.4	— 6.6	61	17	37	9	24	22	30	....	....	....	0.62	— 3.1	8	8,119	w.	38	nw.	19	8	11	9	5.6	1.0
Louisville	525	114	136	29.52	30.12	.00	31.5	— 6.7	65	17	39	12	23	24	34	27	23	74	1.16	— 3.2	9	6,423	nw.	40	nw.	3	10	8	10	5.3	1.8
Evansville	434	72	82	.....	.....	.....	31.4	.....	65	17	39	13	23	24	33	....	....	....	1.34	.. ...	9	4,293	w.	30	sw.	3	12	10	6	4.1	0.8
Indianapolis	822	154	164	29.18	30.11	+ .01	24.0	— 8.3	51	17	31	3	6	17	31	21	18	80	1.63	— 2.0	10	7,459	w.	37	sw.	9	8	8	12	6.2	7.9
Cincinnati	628	152	157	29.40	30.12	.00	27.2	— 9.2	56	17	35	8	6	20	31	24	20	75	1.35	— 2.3	11	6,779	nw.	34	w.	3	7	11	10	5.8	4.1
Columbus	824	87	100	29.16	30.10	.00	23.5	— 8.6	44	25	31	5	24	16	28	21	17	77	0.88	— 2 8	10	6,286	w.	27	nw.	19	6	11	11	6.3	3.2
Pittsburg	842	116	123	29.09	30.05	— .07	24.6	— 8.8	48	16	32	7	23	18	24	21	15	69	0.91	— 1.9	14	5,902	nw.	27	nw.	4	4	12	12	6 8	5.7
Parkersburg	638	77	84	29.39	30.12	.00	27.0	— 9.3	51	3	35	5	23	19	29	25	22	86	1.12	— 2.0	5	5,521	nw.	35	nw.	19	7	4	17	7.1	2.1
Elkins	1,940	41	50	27.91	30.08	— .05	23.0	.....	54	17	32	0	7	14	37	20	16	77	1.17	... ...	17	4,551	w.	27	w.	18	4	12	12	6.7	8.7
Lower Lake Region.							18.2	— 8.3											80										7.3	
Buffalo	767	178	206	29.10	30.00	— .07	17.8	— 6.7	33	25	23	3	23	13	18	15	11	78	3.26	+ 0.4	23	11,747	w.	42	sw.	25	0	14	14	7.6	32.6
Oswego	335	76	87	29.54	29.94	— .14	18.6	— 6.0	34	26	24	— 2	24	13	28	17	14	81	1.55	— 1.0	18	9,796	nw.	33	nw.	6	2	4	22	8.1	15.5
Rochester	523	81	90	29.35	29.96	— .12	17.8	— 6.6	35	25	23	1	24	12	21	15	12	83	3.69	+ 1.0	23	7,286	sw.	27	nw.	5	1	11	16	7.8	36.9
Erie	713	92	102	29.21	30.03	— .04	18.8	— 8.7	39	4	25	— 2	24	13	23	17	15	87	1.34	— 2.1	16	8,117	w.	32	nw.	12	1	10	17	7.8	11.4
Cleveland	762	190	201	29.18	30.06	— .03	19.5	— 8.5	40	4	26	2	23	14	22	17	11	72	1.28	— 1.6	14	11,093	sw.	49	w.	4	4	9	15	6.9	10.6
Sandusky	629	62	70	29.34	30.07	— .02	18.9	—10.0	37	17	26	2	23	12	23	17	13	80	0.91	— 2.0	10	6,425	w.	33	nw.	4	4	7	17	7.4	7.2
Toledo	628	123	127	29.34	30.08	.00	17.9	—10.3	35	18	25	0	23	11	26	16	12	78	1.13	— 0.9	7	7,468	w.	30	ne.	9	5	12	11	6.1	11.3
Detroit	730	160	190	29.21	30.06	— .01	16.4	— 9.8	34	18	22	— 1	23	10	21	15	12	82	1.64	— 0.7	10	8,497	w.	33	ne.	9	7	7	14	6.5	16.4
Upper Lake Region.							14.6	— 4.6											82										5.8	
Alpena	609	61	80	29.31	30.02	— .05	15.1	— 2.9	32	18	23	— 4	14	7	31	13	10	84	0.35	— 1.7	7	6,856	w.	33	nw.	20	7	7	14	6.0	5.9
Escanaba	612	43	57	29.34	30.06	— .00	11.8	— 4.0	31	16	22	— 8	15	2	34	10	8	90	0.36	— 1.2	7	5,176	nw.	30	nw.	20	7	12	9	5.6	4.6
Grand Haven	632	55	92	29.35	30.05	— .01	18.4	— 6.6	31	18	24	— 4	15	13	30	17	15	83	1.90	— 0.3	17	9,152	nw.	35	w.	24	5	6	17	7.2	21.7
Houghton	668	66	74	.....	.....	.....	11.2	.....	44	28	19	— 7	13	3	45	....	....	...	1.00	.....	20	4,811	nw.	24	nw.	19	5	3	20	7.6	9.8
Marquette	734	79	116	29.20	30 05	— .01	13.5	— 3.8	36	28	18	— 1	22	8	28	12	10	91	0.83	— 1.0	17	7,285	w.	36	nw.	20	5	9	14	6.8	13.7
Port Huron	638	70	130	29.31	30.06	— .01	18.2	— 4.8	41	25	28	— 6	23	9	34	14	11	84	1.38	— 1.1	11	7,775	w.	36	n.	4	10	6	12	5.9	16.8
Sault Ste. Marie	614	40	61	29.28	30.00	— .06	10.9	— 1.6	33	3	20	—12	14	2	33	8	6	84	0.22	— 1.1	7	5,029	w.	35	nw.	20	7	11	10	6 0	2.2
Chicago	823	241	274	29.17	30.11	+ .03	17.0	— 9.8	35	17	23	— 1	6	11	19	16	13	85	2.05	— 0.2	7	11,162	w.	58	ne.	3	16	7	5	3.8	21.1
Milwaukee	681	124	142	29.31	30.10	+ .02	16.6	— 6.1	32	16	23	— 2	6	10	25	14	10	75	1.92	+ 0.1	6	7,874	w.	38	ne.	3	12	7	9	4.6	22.9
Green Bay	617	49	57	29.37	30.10	+ .01	13.0	— 3.2	31	16	22	— 6	22	4	26	10	5	72	0.49	— 1.8	6	5,452	sw.	32	n	3	9	10	9	5.5	6.4
Duluth	702	95	115	29.29	30.11	+ .02	10.9	— 3.6	34	28	18	—12	5	3	26	9	4	75	0.72	— 0.4	9	6,647	nw.	36	nw.	18	12	9	7	4.8	9.0
North Dakota.							9.7	+ 2.4											79										4.0	
Moorhead	935	54	60	29.10	30 21	+ .06	8.6	+ 4.1	46	13	18	—18	5	0	38	7	5	90	0.32	— 0.5	4	7,048	nw.	36	nw.	17	10	11	7	4.6	3.2
Bismarck	1,674	16	29	28.84	30.26	+ .10	11.4	+ 1.9	56	13	22	—16	4	0	44	8	1	67	0.16	— 0.4	3	6,430	nw.	46	nw.	22	18	5	5	3.7	1.6
Williston	1,875	15	31	28.11	30.37	+ .10	9.0	+ 1.3	51	28	18	—21	4	— 1	37	7	3	80	0.34	0.0	8	5,917	nw.	60	nw.	17	18	8	2	3.8	3.1

TABLE I.—*Climatological data for Weather Bureau Stations, February*, 1901—Continued.

Stations.	Elevation of instruments: Barometer above sea level, feet.	Elevation of instruments: Thermometers above ground.	Elevation of instruments: Anemometer above ground.	Pressure, in inches: Mean actual, 8 a. m. + 8 p. m. + 2.	Pressure, in inches: Mean reduced.	Pressure, in inches: Departure from normal.	Temperature of the air, in degrees Fahrenheit: Mean max. + mean min. + 2.	Temperature: Departure from normal.	Temperature: Maximum.	Temperature: Date.	Temperature: Mean maximum.	Temperature: Minimum.	Temperature: Date.	Temperature: Mean minimum.	Temperature: Greatest daily range.	Mean wet thermometer.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches: Total.	Precipitation: Departure from normal.	Precipitation: Days with .01, or more.	Wind: Total movement, miles.	Wind: Prevailing direction.	Wind: Maximum velocity: Miles per hour.	Wind: Maximum velocity: Direction.	Wind: Maximum velocity: Date.	Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness, tenths.	Total snowfall
Upper Mis. Valley.							20.4	— 5.6										73	1.10	— 0.8									4.3	
Minneapolis	.....	99	208	.....	.....	.....	12.2	— 4.0	40	13	20	—13	5	4	30	....	....	....	0.26	— 0.8	2	6,934	nw.	28	nw.	19	9	15	4	....	4.5
St. Paul	837	114	124	29.17	30.15	+ .03	12.6	— 3.2	36	13	20	—10	5	5	27	11	8	82	0.40	— 0.5	4	5,868	nw.	26	nw.	19	13	11	4	3.8	4.0
La Crosse	714	70	78	.....	.....	.....	13.9	— 6.2	34	28	22	— 5	5	6	33	....	....	....	0.64	— 0.5	4	4,558	nw.	24	w.	25	12	10	6	4.4	9.6
Davenport	606	71	79	29.43	30.14	+ .04	15.7	— 9.6	39	17	24	— 7	6	7	35	14	12	85	1.59	0.0	7	5,611	w.	30	n.	3	17	6	5	3.4	17.7
Des Moines	861	84	88	29.20	30.20	+ .08	20.0	— 3.1	44	17	29	— 8	10	11	31	18	14	80	1.11	— 0.2	6	5,352	nw.	28	ne.	3	11	9	8	4.8	13.5
Dubuque	698	101	109	29.34	30.15	+ .06	14.5	— 8.1	38	17	24	—10	6	6	36	13	10	86	1.07	— 0.4	6	5,074	nw.	32	nw.	19	18	4	6	3.4	11.3
Keokuk	614	63	78	29.45	30.16	+ .06	21.9	— 6.4	45	17	28	— 3	5	15	29	19	15	76	0.75	— 1.0	5	5,588	nw.	30	nw.	19	20	2	6	3.0	6.6
Cairo	356	87	93	29.74	30.15	+ .05	34.2	— 5.2	68	17	42	15	23	27	33	30	24	71	1.78	— 2.2	7	6,220	nw.	42	sw.	3	5	12	11	6.2	2.7
Springfield, Ill	644	82	93	29.41	30.14	+ .03	24.3	— 6.0	50	17	31	3	5	18	25	21	16	74	1.31	— 2.1	10	6,836	nw.	31	nw.	19	11	9	8	4.8	4.6
Hannibal	534	75	110	.....	.....	.....	24.4	— 6.1	49	17	32	— 3	6	17	30	....	....	....	1.32	— 0.4	10	6,248	nw.	29	n.	3	15	5	8	4.4	8.7
St. Louis	567	111	210	29.50	30.15	+ .04	31.0	— 4.1	60	17	38	12	6	24	29	27	21	71	1.86	— 0.9	8	7,356	w.	45	w.	3	13	5	10	5.0	8.6
Missouri Valley.							22.7	— 1.6										75	1.00	— 0.2									4.6	
Columbia	784	4	84	.....	.....	.....	26.6	— 8.6	52	14	35	4	5	18	33	....	....	....	1.79	— 0.8	7	6,347	nw.	40	nw.	19	12	5	11	5.3	5.2
Kansas City	963	78	95	29.11	30.20	+ .08	26.7	— 4.3	52	28	34	2	5	19	29	24	21	79	1.43	— 0.4	9	5,472	nw.	32	nw.	19	13	7	8	4.4	13.8
Springfield, Mo	1,324	100	103	28.68	30.15	+ .05	32.0	— 2.7	60	28	40	12	5	24	27	28	24	76	1.86	— 1.6	7	7,127	nw.	37	sw.	3	9	12	7	5.1	3.1
Topeka	.....	81	....	.....	.....	.....	26.3	— 5.0	55	28	35	— 6	10	17	40	....	....	....	1.87	+ 0.4	6	.....	nw.	....	.....	...	10	12	6	4.6	17.9
Lincoln	1,189	75	84	28.84	30.19	+ .04	23.6	+ 0.2	50	28	34	— 4	4	15	29	20	16	75	0.79	— 0.2	5	7,320	nw.	36	n.	3	12	8	8	4.6	8.7
Omaha	1,105	115	121	28.93	30.18	+ .04	22.8	— 2.2	46	17	31	0	9	15	27	20	17	82	0.66	— 0.1	2	6,389	nw.	36	n.	3	11	10	7	4.5	7.0
Valentine	2,598	39	40	27.33	30.23	+ .09	18.2	— 3.3	57	28	32	—21	9	4	44	15	12	81	1.19	+ 0.4	4	6,203	nw.	54	nw.	17	13	8	7	4.8	12.4
Sioux City	1,135	96	164	.....	.....	.....	20.0	+ 1.0	44	28	29	— 8	9	11	38	....	....	....	0.54	— 0.1	6	8,491	nw.	45	nw.	17	16	4	8	4.0	9.6
Pierre	1,572	43	50	28.46	30.24	+ .07	17.9	+ 2.5	62	28	29	—13	10	7	45	14	6	60	0.53	+ 0.2	9	4,760	nw.	30	nw.	22	10	9	9	5.1	5.7
Huron	1,306	56	67	28.72	30.23	+ .06	15.8	+ 3.8	54	13	28	—12	10	3	49	11	5	70	0.28	— 0.3	4	7,235	nw.	35	nw.	17	11	15	2	4.3	1.8
Yankton	1,233	52	58	.....	.....	.....	19.8	+ 0.6	52	28	31	—10	9	9	41	....	....	....	0.61	— 0.1	4	5,851	nw.	33	nw.	17	18	5	5	3.5	6.1
Northern Slope.							19.3	— 1.7										76	0.62	0.0									4.9	
Havre	2,505	46	47	27.43	30.25	+ .09	14.5	+ 1.3	55	28	25	—15	5	4	48	13	11	88	0.46	— 0.1	7	6,945	sw.	48	sw.	16	8	15	5	4.6	4.6
Miles City	2,371	42	50	27.57	30.23	+ .07	17.6	+ 1.4	68	28	28	—20	6	7	46	14	14	93	0.44	— 0.7	9	3,207	s.	30	nw.	22	14	8	6	4.1	3.6
Helena	4,110	88	93	25.83	30.23	+ .08	21.8	+ 0.1	54	28	29	— 7	5	14	28	18	13	69	0.41	— 0.3	6	4,742	sw.	45	sw.	27	7	10	11	5.8	3.6
Kalispell	2,965	45	51	26.98	30.21	+ .07	23.1	.....	51	28	31	— 4	5	15	28	21	16	76	0.84	.....	10	3,485	w.	36	sw.	16	9	11	8	4.9	6.4
Rapid City	3,234	46	50	26.64	30.17	+ .01	20.5	— 0.1	61	28	31	—12	9	10	39	18	14	80	0.53	— 0.1	6	4,504	nw.	42	sw.	16	9	10	9	4.9	5.3
Cheyenne	6,088	56	64	23.92	30.27	+ .12	22.6	— 4.7	53	16	34	— 9	5	11	41	19	14	71	1.10	+ 0.7	10	7,206	nw.	54	nw.	16	11	8	9	5.2	9.5
Lander	5,372	28	36	24.61	30.29	+ .13	16.8	— 6.2	58	28	30	—18	10	3	41	12	8	73	0.94	+ 0.3	6	1,874	sw.	36	w.	16	12	10	6	4.7	9.4
North Platte	2,821	43	52	27.14	30.26	+ .11	21.6	— 3.7	58	28	33	—18	9	10	43	18	14	75	0.44	0.0	6	5,469	w.	36	nw.	17	10	10	8	5.1	7.4
Middle Slope.							23.9	— 2.5										72	0.68	— 0.2									5.2	
Denver	5,291	79	151	24.68	30.24	+ .10	27.7	— 4.5	61	28	39	— 7	9	16	38	22	15	65	0.06	— 0.5	3	4,869	sw.	43	nw.	21	10	13	5	4.4	3.0
Pueblo	4,685	80	86	25.26	30.16	+ .03	28.8	— 1.3	66	21	44	— 2	9	14	51	23	16	66	0.07	— 0.4	4	3,811	se.	38	w.	16	11	14	3	4.6	1.1
Concordia	1,398	42	47	28.64	30.22	+ .07	25.0	— 3.2	57	28	34	— 8	5	16	36	22	18	79	1.57	+ 0.6	4	4,305	n.	30	n.	3	11	8	9	4.9	15.4
Dodge	2,509	44	52	27.44	30.18	+ .08	30.2	— 1.6	69	27	42	— 2	9	19	44	25	22	79	0.48	— 0.2	8	6,366	nw.	34	nw.	8	8	12	8	5.5	5.1
Wichita	1,358	78	85	28.68	30.18	+ .08	31.1	— 0.7	67	27	40	3	9	22	35	26	21	72	1.29	+ 0.1	5	6,147	n.	30	s.	24	9	7	12	5.8	4.7
Oklahoma	1,214	54	62	28.80	30.15	+ .06	36.6	— 3.9	66	28	46	13	9	27	34	31	26	69	0.64	— 0.5	6	6,921	n.	31	nw.	8	8	6	14	6.3	2.3
Southern Slope.							33.4	— 2.4										70	0.96	— 0.3									5.4	
Abilene	1,738	45	54	28.25	30.13	+ .05	43.0	— 2.9	77	21	54	13	23	32	41	36	30	69	1.44	+ 0.1	9	6,103	nw.	36	w.	2	7	11	10	5.9	4.0
Amarillo	3,676	54	61	26.24	30.14	+ .05	33.8	— 1.8	72	21	46	6	9	22	46	28	23	72	0.48	— 0.7	4	10,087	sw.	44	sw.	16	10	12	6	4.8	4.4
Southern Plateau.							45.9	+ 1.1										56	2.58	+ 1.7									3.8	
El Paso	3,762	10	110	26.15	30.03	— .01	49.7	+ 0.3	80	21	62	26	14	37	38	39	28	52	0.68	+ 0.3	7	7,630	nw.	50	nw.	22	9	16	3	4.1	T.
Santa Fe	7,013	47	50	23.17	30.06	.00	34.2	+ 2.2	58	21	43	9	3	25	24	28	23	66	1.30	+ 0.5	11	4,035	nw.	27	nw.	16	14	10	4	4.0	8.9
Flagstaff	6,907	12	25	23.26	30.15	.....	31.6	+ 0.2	56	27	42	0	14	22	43	30	....	....	8.36	+ 6.2	13	.....	w.	....	.....	....	5	8	15	....	84.3
Phoenix	1,108	47	57	28.81	29.99	— .06	56.2	+ 1.9	85	28	68	35	12	44	36	47	39	59	1.46	+ 0.6	7	2,949	e.	28	w	6	11	7	10	4.8	
Yuma	141	16	50	29.81	29.95	— .07	59.8	+ 1.2	88	28	71	31	2	49	31	50	38	49	3.01	+ 2.5	5	5,404	n.	35	n.	24	20	5	3	2.0	
Independence	3,910	51	58	25.95	29.98	— .09	43.8	+ 1.0	75	28	54	21	2	34	29	36	27	53	0.64	— 0.1	6	6,013	nw.	36	w.	19	13	12	3	3.9	1.1
Middle Plateau.							34.6	+ 1.2										76	1.55	+ 0.5									6.8	
Carson City	4,720	82	92	25.24	30.13	+ .03	34.8	— 1.7	67	27	46	— 8	11	24	39	31	29	85	2.30	+ 0.8	13	4,209	sw.	42	w.	7	2	12	14	7.1	12.5
Winnemucca	4,344	59	70	25.65	30.15	+ .02	31.8	— 0.7	65	28	42	— 5	11	22	39	30	26	78	1.87	+ 0.9	16	6,674	sw.	36	sw.	16	4	3	21	7.9	11.6
Modena	5,479	10	38	24.57	30.19	.....	29.6	.....	61	27	40	—12	13	19	34	27	24	81	3.63	.....	12	4,925	w.	....	.....	...	9	3	16	....	33.9
Salt Lake City	4,366	105	110	25.62	30.16	— .02	35.1	+ 2.2	55	20	41	15	9	29	22	31	27	73	1.77	+ 0.5	12	2,682	nw.	21	nw.	17	5	10	13	6.3	11.2
Grand Junction	4,608	43	50	25.35	30.13	— .01	36.5	+ 5.2	64	28	47	14	14	26	33	30	24	66	0.25	— 0.3	8	2,586	nw.	23	nw.	24	5	10	13	6.0	2.8
Northern Plateau.							33.1	+ 3.6										76	1.70	+ 0.1									6.4	
Baker City	3,471	53	58	26.44	30.14	+ .01	30.2	+ 5.2	47	28	37	5	9	24	25	28	23	75	1.83	+ 0.1	13	3,519	se.	25	nw.	7	4	4	20	7.8	3.2
Boise	2,739	61	68	27.22	30.16	— .02	35.9	+ 1.2	63	28	44	9	4	28	31	32	28	75	1.27	— 0.3	13	2,686	se.	24	se.	16	4	10	14	6.9	1.9
Lewiston	770	52	61	.....	.....	.....	39.8	.....	67	28	48	17	9	32	28	....	....	...	1.44	+ 0.3	13	3,182	e.	30	sw.	16	11	5	12	5.4	0.6
Pocatello	4,482	48	56	25.48	30.17	— .02	29.8	+ 6.8	54	28	38	2	9	21	33	27	23	76	0.80	— 1.0	10	6,056	w.	36	w	16	9	7	12	6.3	5.3
Spokane	1,943	99	107	28.01	30.14	+ .03	32.0	+ 3.5	59	28	39	10	10	25	31	30	25	75	2.71	+ 0.7	14	3,808	ne.	33	s.	16	6	8	14	6.5	11.4
Walla Walla	1,000	65	73	29.00	30.11	.00	37.6	+ 2.2	69	28	45	17	*	30	26	37	36	92	2.16	+ 0.8	13	3,385	s.	32	sw.	16	10	9	9	5.3	2.7
N. Pac. Coast Reg.							42.0	+ 1.4										78	6.71	+ 0.6									6.3	
Neah Bay	50	7	52	29.94	30.00	— .02	41.6	+ 0.6	56	28	46	30	7	37	18	40	36	82	11.88	+ 1.6	17	6,877	e.	44	e.	3	10	2	16	6.6	1.4
Port Crescent	259	14	20	.....	.....	.....	38.8	+ 1.0	66	28	45	24	9	33	23	....	....	....	3.75	— 1.0	15	2,897	e.	20	w.	16	9	5	14	6.0	4.5
Seattle	123	114	121	29.91	30.04	.00	42.9	+ 3.0	63	28	49	28	9	37	22	39	34	73	4.26	+ 0.6	13	3,907	se.	25	sw.	24	8	10	10	5.8	0.2
Tacoma	213	113	120	.....	.....	.....	41.6	+ 2.7	64	28	47	24	9	36	22	....	....	...	6.56	+ 1.2	16	5,268	s.	34	ne.	5	7	8	13	6.0	2.4
Astoria	20	57	64	.....	.....	.....	42.2	— 0.8	58	28	48	28	9	36	20	....	....	....	9.49	+ 1.6	16	.....	e.	....	.....	...	7	7	14	6.4	T.
Portland, Oreg	154	203	213	29.88	30.04	— 04	43.0	+ 1.8	68	28	49	28	9	37	23	40	35	74	6.52	+ 0.4	16	6,507	nw.	41	ne.	8	6	6	16	6.7	T.
Roseburg	518	56	67	29.44	30.01	— .09	43.8	+ 1.7	70	28	51	21	9	37	37	41	39	84	4.49	— 0.4	19	1,845	nw.	17	n.	8	6	8	14	6.7	0.3
Mid. Pac. C'st Reg.							50.4	+ 1.2										80	6.06	+ 2.0									6.2	
Eureka	62	60	69	29.96	30.02	— .07	49.6	+ 3.4	68	15	55	31	9	44	21	47	44	83	7.41	+ 1.3	19	3,510	se.	33	n.	1	6	5	17	6.7	
Mount Tamalpais	2,375	11	18	27.54	30.05	— .03	46.1	.....	68	28	51	28	9	41	15	42	39	80	5.45	.....	13	11,190	nw.	56	nw.	17	7	12	9	5.8	1.3
Red Bluff	332	50	56	29.68	30.04	— .05	48.9	— 0.1	78	28	56	27	3	42	29	46	43	81	6.64	+ 2.9	13	4,098	n.	46	n.	1	8	3	17	6.5	8.0
Sacramento	69	106	117	29.95	30.03	— .06	50.2	+ 0.4	70	20	57	31	2	44	20	47	44	79	5.32	+ 2.2	10	5,645	se.	36	se.	4	6	9	13	6.5	
San Francisco	155	161	167	29.89	30.05	— .03	52.2	+ 0.5	75	28	58	38	9	47	30	49	46	78	5.03	+ 1.3	12	4,412	w.	35	se.	19	8	13	7	5.4	
Point Reyes Light	.....	12	16	.....	.....	.....	51.2	+ 1.9	73	26	58	35	9	45	27	....	....	....	5.92	+ 2.1	15	8,027	ne.	48	nw.	2	5	10	13	6.6	
S. Pac. Coast Reg.							55.6	+ 2.1										74	4.35	+ 1.7									4.6	
Fresno	330	67	70	29.68	30.03	— .05	51.7	+ 1.5	75	28	59	33	7	44	25	48	45	80	2.35	+ 1.2	12	2,713	se.	30	se.	4	7	9	12	6.1	
Los Angeles	338	74	82	29.63	29.99	— .06	57.4	+ 3.0	88	28	67	34	2	48	31	51	46	73	4.38	+ 1.1	9	3,086	w.	23	sw.	5	9	14	5	4.5	
San Diego	87	94	102	29.88	29.98	— .08	57.5	+ 2.7	83	28	64	44	2	51	24	51	47	72	4.77	+ 2.5	10	4,316	nw.	35	sw.	8	16	7	5	3.2	
San Luis Obispo	201	10	46	29.82	30.04	— .04	55.6	+ 1.3	84	28	65	26	2	46	32	50	45	73	5.89	+ 2.1	9	3,463	n.	22	s.	19	12	8	8	4.7	
West Indies.																														
Basseterre	29	41	54	30.00	30.03	.....	76.8	.....	84	16	82	68	15	71	15	71	68	75	2.06	.....	14	5,166	e.	34	e.	26	12	16	0	3.9	
Bridgetown	30	57	65	29.98	30.01	.....	77.3	.....	86	15	84	67	20	70	17	71	68	72	0.80	— 1.1	12	5,379	e.	24	e.	26	12	5	11	5.1	
Cienfuegos	52	62	67	29.96	30.01	.....	70.8	.....	86	10	80	51	22	62	25	64	62	80	3.07	.....	6	4,931	ne.	26	w	19	18	6	4	3.0	
Grand Turk	11	6	20	.....	.....	.....	75.8	.....	86	24	82	53	21	69	24	....	....	....	0.22	.....	3	.....	se.	....	.....	...	8	17	3	4.8	
Havana	57	87	105	29.98	30.04	.....	71.4	.....	87	11	78	56	23	65	24	64	62	79	1.52	— 0.8	8	7,896	e.	41	w.	19	14	9	5	4.1	
Kingston	286	38	52	29.69	29.99	.....	75.7	.....	87	25	84	63	5	67	23	68	65	75	0.01	.....	1	4,334	ne.	25	se.	26	15	12	1	3.6	
Port of Spain	40	65	66	29.94	29.98	.....	78.2	.....	89	27	87	66	23	70	20	70	67	72	0.31	.....	5	3,370	e.	22	e.	23	5	19	4	5.1	
Puerto Principe	352	55	62	29.68	30.03	.....	72.7	.....	92	9	85	52	22	61	31	65	63	84	0.07	.....	3	4,362	ne.	24	s.	26	15	10	3	3.6	
Roseau	25	37	47	29.99	30.01	.....	77.5	.....	88	16	85	66	7	70	17	69	65	69	0.60	.....	9	3,527	e.	20	e.	23	15	11	2	3.5	
San Juan	82	48	90	29.95	30.03	.....	77.0	.....	89	20	83	67	13	71	20	70	67	73	0.50	— 1.9	5	5,753	se.	30	se.	24	21	7	0	2.5	
Santiago de Cuba	82	26	31	29.91	29.99	.....	76.6	.....	89	10	86	63	5	67	24	68	66	78	0.85	.....	3	2,411	se.	13	ne.	2	18	8	2	3.4	
Santo Domingo	57	37	44	29.98	30.04	.....	74.8	.....	88	1	82	60	4	67	24	70	68	80	0.77	.....	5	3,266	n.	18	n.	2	24	2	2	2.1	
Willemstad	75	39	46	29.87	29.94	.....	79.5	.....	86	14	84	71	18	75	13	72	70	75	0.21	.....	3	7,607	e.	27	e.	9	15	16	3	4.0	

NOTE.—The data at stations having no departures are not used in computing the district averages.

TABLE II.—*Climatological record of voluntary and other cooperating observers, February, 1901.*

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Alabama.	°	°	°	*Ins.*	*Ins.*
Ashville	68	19	40.8	3.56	5.0
Benton				4.32	4.5
Bermuda	72[a]	18[a]	49.6[d]	3.32	4.0
Birmingham	71	21	45.0	3.64	.....
Bridgeport				2.22	
Burkville				5.00	7.0
Calera				4.15	4.0
Camp Hill	71	17	44.2	4.08	6.5
Citronelle	74	25	50.9	6.66	1.0
Clanton	69	21	44.0	5.02	2.5
Daphne	71	26	51.4	1.36	T.
Decatur	71	18	38.9	2.39	....
Demopolis				6.23	6.0
Elba	67[c]	23[c]	48.1[c]	7.70	2.2
Eufaula *a*	70	22	45.4	7.17	4.0
Eufaula *c*				6.59	3.0
Eutaw	72	22	44.2	3.66	3.6
Evergreen	70	22	47.4	6.76	2.2
Florence *a*				3.07	T.
Florence *b*	69[c]	20[c]	39.7[c]	2.70	2.0
Gadsden	74	18	41.3	3.59	T.
Goodwater	71	20	40.7	5.26	5.0
Greensboro	71	23	43.2	4.58	4.5
Greenville				6.43	T.
Ham lton	65	16	38.4	5.15	2.0
Healing Springs	74	21	47.0	4.99	5.0
Helena				5.16	6.0
Highland Home	72	19	46.7	5.99	6.5
Letohatchee				4.24	9.0
Livingston *a*	70	20	43.0	3.27	6.0
Lock No. 4	70	19	40.0	3.96	4.0
Madison Station	71	18	39.5	2.60	0.5
Maplegrove	70	17	38.6	4.00	1.0
Marion	68	21	45.2	4.15	5.0
Mount Willing	69	20	46.7	6.00	7.5
Newbern	70	21	44.2	4.45	5.0
Newburg				2.75	
Notasulga				4.69	5.0
Oneonto	68	11	39.8	4.27	6.0
Opelika		20		7.14	6.0
Oxanna	72	22	43.6	4.54	7.0
Pineapple	72	26	45.8	5.40	5.0
Prattville	72	17	45.6		5.5
Pushmataha	71	17	45.8	4.50	6.0
Riverton	73	16	37.2	2.13	0.1
Scottsboro	68	18	38.2	2.52	3.5
Selma	72	21	44.0	4.39	5.0
Talladega	70	16	42.8	4.54	8.0
Tallassee				4.03	4.0
Thomasville	66	21	44.2	2.06	5.5
Tuscaloosa	69	20	40.6	4.31	5.0
Tuskegee	71	16	44.0	3.18	6.3
Union Springs	70	22	44.7	6.50	7.5
Uniontown	72	19	45.0	5.43	5.2
Valleyhead	69	14	37.6	3.10	T.
Verbena				4.73	5.0
Wetumpka	71	20	41.0	3.40	5.0
Arizona.					
Allaire Ranch				1.31	T.
Arivaca	80	31	51.4	2.08	1.0
Arizona Canal Co. Dam.	84	29	55.1	1.91	
Aztec[e]	87	37	60.0	0.86	
Benson[e]	69	34	49.4	0.35	0.5
Bisbee	75	24	45.6	2.57	6.2
Bowie				1.53	
Buckeye	88	32	56.1	1.40	
Camp Creek	79	30	49.2	3.14	T.
Casagrande[e]	85	45	59.2	1.30	
Chample Camp	86	26	53.8	3.10	
Cochise[e]	76	32	49.4	2.12	2.0
Congress	80	29	52.2	2.71	2.5
Dragoon Summit[e]	70	28	49.9	1.47	5.0
Dudleyville	84	28	51.4	2.26	
Fort Apache	70	34	46.0	2.60	8.0
Fort Defiance	60	1	31.6	2.40	.....
Fort Grant	87	30	49.6	0.50	0.1
Fort Huachuca	75	15	47.2	2.39	5.5
Fort Mohave	85	34	56 6	4.23	
Gilabend[e]	83	39	53.2	0.90	
Ingleside	84	36	55.2	0.83	
Jerome	71	21	44.7	5.41	.....
Maricopa[e]				1.65	
Mesa	85	32	54.0	1.22	
Mohawk Summit[e]	94	40	62.1	1.87	
Mount Huachuca	76	20	47.2	4.32	4.0
Natural Bridge				3.57	21.0
Nogales	80	24	49.4	3.43	4.8
Oracle	70	26	46.2	5.81	15.0
Oro				1.79	
Pantano[b]	80	36	56.0	1.00	3.0
Parker	90	30	59.6	3.25	
Peoria	85	34	55.6	0.89	
Phoenix	84	32	55.0	1.26	
Pima	79	24	48.8	2.03	
Pinal Ranch				3.91	10.0
Prescott	70	4	38.4	2.52	25.0
San Carlos	84	28	50.4	2.74	
Sentinel[e]	86	37	62.2	1.58	
Showlow				3.07	29.0
Signal	91	27	54.6	3.00	
Silverking				3.40	T.
Strawberry	67	4	36.9	3.81	36.0
Supai	72	18	45.7	1 09	
Tombstone	72	28	47.2	1.19	2.0
Tonto	79	28	49.2	2.80	
Tuba	65	19	41.2	0.73	2.5
Tucson	82	31	52.0	1.38	
Vail[b]	78	38	54.2	0.16	T.
Walnut Grove				2.19	0.5
Willcox[e]	75	30	48.9	0.55	3.0
Yarnell				3.17	13.0
Arkansas.					
Amity	76	18	43.1	3.11	2.5
Arkadelphia	75	19	47.7	2.43	2.0
Arkansas City				3.46	7.0
Batesville	72	15	40.2	2.87	
Beebranch	73	15	40.6	2.10	
Blanchard Springs	76	12	44.9	4.07	9.0
Brinkley	72	18	41.2	2.80	T.
Camden *a*				3.88	4.5
Camden *b*	76	20	43.3	4.45	2.5
Conway	78	17	42.0	3.87	T.
Corning	71	15	36.0	2.69	2.5
Dallas	72[f]	22[f]	42.4[f]	2.82	1.0
Dardanelle				2.08	T.
Elon	78	23[f]	47.2[c]	2.42	6.7
Fayetteville	65	13	36.2	1.16	T.
Fulton				3.13	6.2
Hardy	72	14	36.6	2.57	1.2
Helena *a*				2.17	T.
Helena *b*	75	20	48.0	2.30	T.
Hot Springs *a*				1.81	.....
Jonesboro	71	18	40.8	3.43	2.0
Keesees Ferry	70	12	37.2	1.44	2.2
Lacrosse	73	13	37.1	1.90	.....
Lonoke	72	17	41.8	2.21	0.5
Lutherville	68	15	39.0	1.98	.....
Malvern	61[d]	18[h]	39.4[f]	3.20	1.0
Marianna	75	18	43.0	2.44	T.
Marvell	74	19	43.0	2.39	T.
Mossville	65	14	35.4	0.74	0.4
Mount Nebo	70	16	37.0	2.62	1.5
New Gascony	75	21	44.6	2.09	0.5
Newport *a*				2.87	0.5
Newport *b*	72	12	38.4	2.38	.....
Newport *c*	73	16	39.3	3.22	0.1
Oregon	69	12	36.0	0.90	0.5
Osceola	74	16	40.0	2.66	
Ozark	71	20	41.1	1.63	T.
Pinebluff	75	19	43.8	2.28	1.6
Pond	67	10	36.4	1.70	T.
Prescott	75	14	44.6	2.89	5.2
Rison	76	13	44.2	2.93	2.0
Rosadale	76	14	44.3	2.25	5.0
Rush	60			1.40	1.0
Russellville	72	19	41.2	1.69	.....
Silversprings	68	14	37.0	1.74	4.2
Spielerville	73	20	41.0	2.00	1.5
Stuttgart	74	17	42.0	2.74	T.
Texarkana	79	14	45.0	2.61	3.0
Warren	75	13	42.3	3.87	6.0
Washington	78	12	44.5	2.48	5.0
Wiggs	75	12	41.9	2.38	1.0
Winchester	75	14	42.2	2.72	6.0
Winslow	65	18	36.1	1.36	4.0
Witts Springs	68	11	39.2	1.11	0.5
California.					
Angiola	74	21	47.8	.....	
Bakersfield	75	20	49.0	.....	
Balla-t Point L. H.				4.17	
Bear Valley				20.04	77.0
Bellevue				2.46	6.0
Berkeley	73	36	51.2	5.91	
Bishop	79	10	42.6	1.01	5.0
Boca				6.76	37.0
Bodie	50	−26	22.0	2.94	26.5
Bowman				18.79	67.0
Branscomb				10 77	6.0
Caliente[e]	70	34	56.6	2.10	
Campbell	74	30	51.6	5.15	
Cape Mendocino L. H.				10.80	
Cedarville	63	− 7	31.1	3.13	27.5
Chico[e]	81	34	52.6	5.09	T.
Cisco[e]	47	4	30.4	22.45	113.0
Claremont	83	28	52.5	5.13	T.
Corning[e]	76	30	48.6	5.00	2.0
Crescent City	62	30	46.8	13.73	
Crescent City L. H.				12.76	
Cuyamaca[b]	61	24	38.0	13.26	47.2
Delano[e]	75	31	52.5	1.62	
Delta[e]	71	28	45.5	9.28	11.0
Drytown	72	26	48.7	8.83	
Dunnigan[e]	69	30	52.6	5.45	
East Brother L. H.				5.50	
Edmanton	62	11	35.2	15.36	54.0
Elmdale	77	27	50.6	3.81	
Elsinore	92	25	53.8	4.61	
Escondido	95	31	55.4	5.21	
Fallbrook	88	30	55.0	5.17	
Folsom City[e]	76	31	51.3	6.87	
Fort Ross	66	34	49.6	9.72	
Fort Tejon				5.86	.....
Georgetown	73	24	45.0	13.70	27.0
Gilroy (near)	79	25	52.9	3.61	
Grand Island[b]	72	30	51.2	4.96	
Grass Valley				12.27	18.0
Greenville	64	− 7	34.8	7.91	41.5
Hanford	75	29	50.9	2.61	
Healdsburg	84	26	51.1	8.95	
Hollister	76	25	51.2	2.88	
Humboldt L. H.				7.84	
Indio[e]	92	38	64.2	1.46	
Iowa Hill[e]	72	28	45.6	12.61	29.8
Irvine	90	36	60.5	4.97	
Jackson (near)	68	22	45.1	11.24	12.5
Jolon				6.21	
Kent				8.54	
King City[e]	72	28	47.7	3.51	
Kono Tayee	68	31	47.7	4.33	.....
Lakeside				6.27	
Lamesa				5.99	
Laporte[e]	62	12	34.3	18.35	69.8
Las Fuentes Ranch				3.90	
Legrand	75	30	50.3	7.10	
Lemoncove	74	30	52.7	2.84	
Lick Observatory	63	17	40.4	5.92	24.0
Lime Point L. H.				5.71	
Lodi	73	30	50.8	5.75	
Los Gatos[b]	75	32	52.2	9.74	
Mammoth[e]	57	32	61.8	2.70	
Manzana	78	25	47.6	6.68	19.0
Mare Island L. H.				4.39	
Merced *b*	72	25	49.3	3.15	
Mills College				5.90	
Milo				4.46	4.0
Milton (near)				7.10	
Modesto[e]	85	33	54.6	4.27	
Mohave	78	20	46.6	3.18	8.0
Mokelumne Hill[e]		29	45.4	10.25	6.0
Monterio	76	24	48.1	7.05	38.0
Monterey[e]	71	30	54.4	4.11	
Morena	79	30	47.8	9.28	3.0
Mountainview				4.43	
Mount St. Helena				9.96	3.0
Mutah				4.60	20.5
Napa	78	29	51.2	5.12	
Needles[h]	75	28	47.0		
Nevada City	72	17	42.1	13.12	26.0
Newhall[e]	84	24	50.7	6.14	
Niles[e]	82	37	55.8	7.87	
North Bloomfield	75	16	43.0	13.46	40.0
North Ontario	81	32	52.6	6.10	
North San Juan[e]	80	24	48.1	12.44	18.0
Oakland	74	34	52.0	6.02	
Ogilby[e]	90	35	61.2	3.70	
Oleta[e]	69	27	45.6	10.46	4.0
Orland[e]	72	31	49.8	5.14	
Palermo	75	28	49.8	6.33	
Paso Robles[b]	74	24	50.8	5.37	
Peachland[b]	80	30	51.4	7.82	
Piedras Blancas L. H.				5.53	
Pigeon Point L. H.				3.89	
Pilot Creek				16.20	58.0
Pine Crest	84	35	56.8	4.92	
Placerville	70	18	44.2	9.53	7.0
Point Ano Nuevo L. H.				3.62	
Point Arena L. H.				6.16	
Point Bonita L. H.				8.13	
Point Conception L. H.				2.28	
Point Fermin L. H.				1.95	
Point George L. H.				5.04	
Point Hueneme L. H.				1.93	
Point Lobos	68	38	50.8	5.89	
Point Loma L. H.				3.03	
Point Montara L. H.				7.30	
Point Pinos L. H.				5.40	
Point Sur L. H.				4.87	
Pomona (near)	92	28	55.4	4.46	
Poway[b]	88	35	55.6	5.82	
Quincy	58	− 2	35.1	8.21	31.0
Ranch House				4.20	
Redding	78	29	48.8	5.52	T.
Redlands	88	30	54.9	3.79	
Reedly	74	31	52.0		
Represa	72	30	49.8	6.93	
Riovista	71	29	50.4	5.29	
Riverside	88	30	55.8	2.74	
Roe Island L. H.				4.18	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
California—Cont'd.	°	°	°	*Ins.*	*Ins.*
Rosewood	79	21	46.8	4.38	1.0
Sacramento	72	30	50 2	6.17	
Salinas *1	75	32	52.6	5.44	
Salton *1	96	37	65.5	2.80	
San Bernardino	89	27	55.3	4.58	
San Jacinto	89	29	52.4	4.62	
San Leandro *5	76	30	51.9	5.45	
San Luis L. H	.....	...	.....	4.50	
San Mateo *1	76	34	48.5	5.82	
San Miguel *1	76	26	49.8	4.52	
San Miguel Island	85	49	55.4	1.89	
Santa Barbara	84	34	56.4	3.65	
Santa Barbara L. H	.....	.....	.....	3.49	
Santa Clara	.....	...	.....	4.72	
Santa Cruz	81	26	52.0	5.91	
Santa Cruz L. H	.....	.....	.....	3.34	
Santa Maria	86	32	57.0	3.17	
Santa Monica	.....	.....	.....	4.35	
Santa Paula	88	34	57.1	4.34	
Santa Rosa *1	78	27	52.7	5.77	
Shasta	79	27	48.3	8.43	0.5
Sierra Madre	83	33	55.6	8.63	
Sonoma	.....	.....	.....	5.65	
S. E. Farrallone L. H	.....	.....	.....	4.83	
Stanford University	72	25	48.9	4.56	
Stockton	66	25	45.7	5.02	
Storey	72	30	49.0	4.34	
Summerdale	68	11	36.8	18.87	75.0
Susanville	58	— 5	32.6	3.17	27.0
Tehama *1	78	33	48.6	6.17	1.0
Tejon Ranch	75	33	53.3	4.69	
Thermalito	74	29	50.9	6.62	
Trinidad L. H	.....	.....	.....	7.52	
Truckee *1	58	— 8	26.0	7.97	49.0
Tulare *b*	.....	.....	.....	1.47	
Tulare *c*	76	30	52.4	1.49	
Ukiah	81	24	48.4	5.27	
Upperlake	77	26	48.4	4.75	0.5
Upper Mattole *1	72	26	46.7	14.80	1.5
Vacaville *1	76	31	51.7	5.99	
Ventura	89	36	56.1	3.99	
Visalia *b*	74	29	51.4	1.80	
Volcano *1	94	38	61.6	1.75	
Wasco	74	26	50.7	1.31	
West Saticoy	.....	.....	.....	2.97	
Wheatland	72	29	48.8	6.96	
Williams *1	75	33	54.3	3.54	
Wilmington *1	79	37	52.3	2.22	
Wire Bridge *5	74	26	49.0	9.22	T.
Yerba Buena L. H	.....	.....	.....	3.10	
Yreka	59	3	35.0	2.86	.....
Colorado.					
Alford	62	—18	22.5	0.77	13.0
Arkins	.....	.....	.....	0.22	2.2
Blaine	73	—12	31.4	0.15	2.2
Boulder	68	— 2	29.4	0.30	6.2
Boxelder	.....	.....	.....	0.63	8.0
Breckenridge	88	—13	15.6	3.02	47.1
Buenavista	.....	.....	.....	0.11	2.5
Canyon	66	— 4	31.2	0.10	0.8
Castlerock	59	—11	27.2	0.30	6.0
Cedaredge	60	11	36.2	0.59	5.5
Cheyenne Wells	63	—14	24.7	0.38	3.0
Clearview	48	— 6	25.0	0.26	4.0
Colibran	59	0	31.8	0.35	4.0
Colorado Springs	61	— 8	27.0	0.16	3.0
Cope	60	—11	24.7	0.05	1.0
Crook	60	—19	21.8	0.90	14.0
Delta	66	6	37.0	0.13	T.
Dumont	.....	.....	.....	0.79	10.0
Durango	59	— 4	27.4	0.80	14.0
Fort Collins	63	—15	24.5	0.38	5.2
Fort Morgan	59	—18	22.1	0.39	7.5
Fox	.....	.....	.....	0.43	6.0
Gilman	.....	.....	.....	2.05	31.5
Gleneyrie	59	— 5	27.6	0.44	5.5
Greeley	64	—21	22.0	0.45	7.0
Grover	.....	.....	.....	0.52	7.0
Gunnison	53 *e*	—29 *e*	19.8 *e*	0.79	10.0
Hamps	62	—12	25.1	0.07	1.5
Hoehne	67	— 8	30.3	0.15	2.5
Holly	63	— 9	29.0	0.43	5.0
Holyoke (near)	60	—21	21.6	0.33	6.5
Hugo	.....	.....	.....	0.07	1.5
Husted	60	—15	25 3	0.19	2.5
Lake Moraine	48	— 3	23.0	0.20	3.2
Lamar	71	—14	29.4	0.38	5.5
Laporte	.....	.....	.....	0.27	4.5
Las Animas	70	— 4	29.6	0.13	2.0
Lay	52	—18	25.0	1.09	16.5
Leadville (near)	.....	.....	.....	2.13	30.5
Leroy	58	—12	22.0	0.49	5.5
Longs Peak	45	—13	21.0	0.47	5.0
Mancos	62	4	31.2	1.33	9.8
Marshall Pass	.....	.....	.....	1.23	20.0
Meeker	54	—10	27.9	0.75	9.0
Mitchell	.....	.....	.....	1.33	19.0
Montrose	.....	.....	.....	0.39	.....
Moraine	50	—13	22.8	0.72	9.0
Pagoda	51	—13	26.2	2.05	17.0
Parachute	60	4	34.1	1.10	10.0
Perrypark	.....	.....	.....	0.20	3.2
Rangely	53	—23	21.2	0.92	12.2
Rockyford	69	— 5	28.6	0.10	0.5
Rogers Mesa	62	11	35.9	0.29	0.8
Ruby	.....	.....	.....	4.00	59.0
Saguache	59	— 6	28.9	T.	T.
Salida	64	— 3	32.1	0.07	1.0
San Luis	63	— 5	29.6	0.64	6.8
Santa Clara	60	— 4	28.5	0.09	2.2
Sapinero	.....	.....	.....	2.10	11.0
Sargents	.....	.....	.....	1.34	17.0
Seibert	.....	.....	.....	0.41	4.5
Silt	57	8	32.2	0.52	3.7
Springfield	.....	.....	.....	0.23	3.5
Sugarloaf	50	—10	23.8	0.33	6.0
Telluride	51	— 3	25.6	1.36	21.0
Trinidad	72	— 5	34.7	0.75	10.0
T. S. Ranch	59	14	35.8	0.10	2.0
Twinlakes	.....	.....	.....	0.62	10.0
Vilas	.....	.....	.....	T.	T
Wagon Wheel	56	—31	15.6	0.47	8.0
Walden	46	—25	19.4	0.35	6.2
Wallet	.....	.....	.....	0.13	2.0
Westcliffe	52	— 4	26.2	0.09	1.5
Wray	65	—15	26.0	1.37	8.0
Yuma	.....	.....	.....	1.11	14.0
Connecticut.					
Bridgeport	47	3	24.6	0.85	9.2
Canton	43	0	19.4	0.49	5.5
Colchester	45	4	22.0	0.55	5.5
Falls Village	.....	.....	.....	0.84	8.8
Hartford *b*	44	6	22.2	0.49	5.5
Hawleyville	42	0	20.8	0.60	9.0
Lake Konomoc	.....	.....	.....	0.80	.....
Middletown	46	— 2	22.9	0.63	6.5
New London	41	9	23.8	0.58	1.5
North Grosvenor Dale	45	— 5	19.7	1.17	.....
Norwalk	45	— 5	21.0	0.67	8.5
Southington	43	— 4	21.8	0.90	5.2
Storrs	41	3	19.4	1 05	7.0
Voluntown	44	— 3	21 0	1.25	9.5
Wallingford	.....	.....	.....	0.65	5.5
Waterbury	44	0	21.8	0.55	4.5
West Cornwall	37	0	17.9	0.84	8.5
West Simsbury	.....	.....	.....	0.52	4.0
Delaware.					
Millsboro	52	1	27 5	1.13	2.0
Newark	46	7	26.2	0.97	1.0
Seaford	50	12	29.6	0.82	1.0
Wyoming	.....	.....	.....	1.84	T.
District of Columbia.					
Distributing Reservoir *5	51	15	30.4	0.35	.....
Receiving Reservoir *5	52	12	28.9	0.40	.....
West Washington	56	12	29.6	0.75	0.1
Florida.					
Archer	79	26	53.4	8.33	
Bartow	85	29	58.0	3.34	
Brooksville	80	28	54.6	4.26	
Carrabelle	70	27	52.3	9.16	
Clermont	85	31	57.8	2.44	
Dalkeith	78	24	51.7	7.15	
De Funiak Springs	72	20	50.6	4.86	
Deland	85	24	54.7	.....	
Eustis	83	31	57.8	2.52	
Federal Point	80	29	53.2	4.91	
Fort George *1	76	32	54.0	.....	
Fort Meade	84	24	57.5	2.01	
Fort Pierce	87	32	61.0	1.79	
Gainesville	84	25	53.8	9.20	
Huntington	79	29	54.6	4.83	
Hypoluxo	87	40	65.6	1.25	
Inverness	82	24	54.2	4.72	
Jasper	73	26	51.5	.....	
Kissimmee	84	28	58.2	2 26	
Lake Butler	76	28	52.6	10.65	
Lake City	76	28	53.2	7.65	
McAlpin	.....	.....	...	6.75	
Macclenny	77	26	53.0	6.67	
Manatee	82	28	57.8	2.15	
Marco	85	38	63.8	1.06	
Marianna	74	23	49.0	3.57	T.
Merritt Island	83	34	59.5	1.34	
Miami	88	38	65.7	... ...	
Micanopy	80	27	54.4	6.52	
Middleburg	79	24	52.0	8.85	
Myers	83	35	60.4	0 72	
New Smyrna	84	25	54.8	2.60	
Nocatee	85	30	60.6	1 49	
Ocala	82	25	54.9	5.35	
Orange City	84	25	56.4	2.56	
Orlando	83	31	58.6	3.27	
Plant City	85	25	57.6	2.74	
Quincy	75	23	49.6	5.32	
Rockwell	80	27	56.4	5.25	
St. Andrews	71	23	52.0	3.72	
St. Augustine	72	31	51.0	5.02	
St. Francis	83	22	55.2	2.47	
Sebastian	84 *b*	34 *d*	60.4 *c*	1.66	
Stephensville *1	78	29	51.6	11.32	
Sumner	85	22	53.4	5.99	
Switzerland *1	72	28	50.4	7.36	
Tallahassee	68	25	48.4	5.05	
Titusville	86	28	57.2	7.80	
Georgia.					
Adairsville	67 *c*	21 *d*	40.5 *c*	3.69	0.1
Albany	64	24	46.0	6.94	.....
Allapaha	70	25	47.6	4.54	1.5
Allentown	70	9	45.9	4.59	7.2
Americus	68	19	43.8	5.41	4.0
Athens *b*	70	15	40.3	3 57	3.0
Auburn	70	15	41.0	3.47	4.0
Blakely	70	25	48.6	6.48	2.0
Brent	71	12	44.0	3.41	6.2
Canton	.....	...	.....	3.88	1.0
Carlton	.....	.....	.....	3.17	4.0
Clayton	68	14	38.0	3.10	1.0
Columbus	66 *d*	22 *d*	43.6 *d*	3.94	4.5
Covington	74	15	43.2	3.95	6.0
Dahlonega	70	9	37.0	3.60	T.
Diamond	69	12	36.6	3.32	T
Dublin	.....	.....	.....	4.91	5.5
Elberton	70	13	44.0	3.75	4.5
Experiment	66	17	42.2	3.74	5.5
Fitzgerald	74	21	48.3	6.04	2.0
Fleming	76	20	49.2	5.40	
Fort Gaines	70	23	48.0	8.52	2.2
Gainesville	65	18	38.8	3.53	1.0
Gillsville	72	15	42.6	3.43	2.5
Greenbush	71	11	39.8	2.96	0.1
Harrison	70	14	45.7	3.93	7.0
Hawkinsville	70	21	45.6	4.49	7.0
Hephzibah	70	18	44.8	4.30	4.0
Jesup	76	23	49.0	6.19	
Lost Mountain	68	18	40.1	2.98	1.0
Louisville	71	17	45.0	4.01	8.0
Lumpkin	70	21	46.6	5.53	3.0
Marshallville	70	19	46.0	3.98	6.0
Mauzy	75	22	49.5	3.94	T.
Millen	72	16	45.8	5.01	4.0
Monticello	69	14	43.4	3.09	4.0
Morgan	72	20	46.0	6.87	3.0
Naylor	72	25	50.0	6.02	T.
Newnan	65	17	39.0	5.86	6.0
Oakdale	.....	.....	.....	3.52	2.0
Piscola	70	25	50.4	6.60	
Point Peter	72	10	41.7	3.68	4.0
Poulan	73	22	47.8	6.57	2.0
Putnam	68	19	45.8	3.94	3.4
Quitman	72	22	49.4	6.99	
Ramsey	68	14	39 8	2.74	T.
Resaca	.....	.....	.....	3.36	
Rome	68	19	39.6	3.82	1.0
Statesboro	74	19	47.0	4.14	6.0
Talbotton	70	14	44.6	3.69	6.0
Thomasville	73	24	50.0	4.59	
Toccoa	.....	16	.....	3.60	3.0
Valona	76	25 *d*	49.9	5.03	
Vidalia	74	18	47.0	5.49	4.0
Washington	.....	.....	.....	3.18	4.8
Waycross	72	25	48.0	4.01	
Waynesboro	72	.....	.....	2.44	6.8
Westpoint	69	15	44.8	4.18	7.0
Woodbury	.....	.....	.....	2.88	6.0
Idaho.					
Albion	54	— 1	29.4	1.79	4.8
American Falls	69	— 3	28.8	1.29	6.0
Atlanta	46	— 7	25.0	2 63	5.0
Blackfoot	52	— 2	26.4	0.51	3.5
Burnside	38	— 1 *i*	19.4 *d*	0.35	3.5
Challis	47	— 9	24.4	0.79	6.4
Chesterfield	45	—25	17 4	1.35	7.0
Downey	48	— 9	28.2	0.70	4.0
Forney	61	—18	22.4	1.94	4.2
Garnet	68	10	37.0	1.04	1.0
Hagerman	67	8	36.2	1.42	T.
Hailey	50	— 6	22.8	2.17	14.0
Kootenai	50	— 1	22.6	2.90	29.0
Lake	46	—28	19.9	1.30	13.0
Lakeview	52	8	30.0	2.94	6.5
Lost River	47	—14	18.5	0.34	2.5
Moscow	50	11	31.2	3.06	.....
Murray	48	1	26.8	4.84	15.0
Oakley	60	— 4	31.6	1 30	7.5
Ola	53	3	32.4	3.39	3.6
Paris	55	—20	21.6	1.60	.....
Payette	60	5	35.2	4.76	12.2
Pollock	57	12	36.4	0.95	.....

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Idaho—Cont'd.	°	°	°	*Ins.*	*Ins.*
Priest River	47	1	27.8	2.59	10.0
St. Maries	51	6	31.5	2.77	3.8
Swan Valley	56	−17	20.8	0.75	5.5
Weston	52	− 2	28.4	1.40	9.5
Illinois.					
Albion	61	7	28.8	2.34	5.0
Aledo	41	− 9	17.2	1.88	10.5
Alexander	50	0	24.4	1.44	5.4
Ashton	38	−14	13.6	1.16	11.6
Astoria	44	− 6	22.3	0.97	9.5
Aurora *a*	37	−14	14.2	1.73	17.0
Bloomington	50	− 4	21.8	1.84	10.6
Bushnell	50	0	22.0	1.10	8.5
Cambridge	40	− 7	17.0	1.90	19.0
Carlinville	57	4	27.4	1.81	7.6
Carlyle	.....	.....	.....	1.81	.....
Centralia	64	9	30.7	2.25	7.3
Charleston	54	1	26.1	2.30	7.4
Chemung	33	−16	9.6	1.27	19.0
Chester	.....	.....	.....	1.60	T.
Cisne	57	8	28.3	1.91	6.0
Coatsburg	42	− 5	27.6	1.07	3.7
Cobden	65	5	32.6	2.45	3.0
Danville	38	5	23.4	0.56	4.8
Decatur	52	0	23.9	1.17	6.4
Dixon	38	−12	14.8	0.54	14.2
Dwight	44	−11	17.2	1.08	9.5
Effingham	56	4	27.0	2.16	8.3
Equality	67	9	32.6	1.76	2.2
Flora	60	5	28.4	2.19	8.6
Friendgrove [e]	60	10	29.4	2.08	.....
Galva	41	− 8	16.1	1.77	15.4
Grafton	.....	.....	.....	1.95	4.0
Grayville	50	12	31.4	2.03	5.8
Greenville	60	6	28.0	2.02	5.1
Griggsville	56	− 1	24.8	1.51	.....
Halfway	63	9	31.9	1.45	3.4
Halliday	62	9	33.6	1.25	.....
Havana	46	−12	20.6	1.09	.....
Henry	45	−15	17.2	1.23	18.5
Hillsboro	54	5	26.2	1.98	7.5
Joliet	37	− 9	15.6	1.62	16.0
Kishwaukee	40	−11	13.6	2.40	19.5
Knoxville	40	−12	16.2	1.07	13.0
Lagrange	38	−12	14.6	2.06	22.0
Laharpe	42	−15	19.8	1.65	11.0
Lanark	39	−20	12.6	0.70	11.0
Loami	.....	.....	.....	1.49	5.7
McLeansboro	62	10	30.0	2.10	2.7
Martinsville	55	4	25.6	0 80	8.0
Martinton	49	−20	16.4	1.30	11.0
Mascoutah	63	5	29.1	2.55	11.5
Mattoon	54	8	28.2	0.90	6.2
Minonk	42	−12	17.0	1.31	10.5
Monmouth	41	−13	17.0	1.19	12.0
Monticello	46	0	22.0	1.25	4.0
Morgan Park	.....	.....	.....	1.45	16.5
Morrisonville	54	4	26.0	1.66	6.9
Mount Carmel	.....	.....	.....	1.70	6.2
Mount Pulaski	49	− 2	22.4	1.36	7.7
Mount Vernon	60	5	27.8	2.54	4.0
New Burnside	67	8	30.4	2.14	11.0
Olney	60	6	28.6	2.88	16.8
Ottawa	43	−10	17.8	2.10	21.5
Palestine	58	5	26.2	2.95	10.2
Pana	53	4	26.6	1.92	7.0
Paris	53	2	24.0	1.65	.....
Peoria *a*	.....	.....	.....	1.25	11.0
Peoria *b*	43	− 6	20.8	1.24	10.8
Philo	51	− 1	22.5	1.99	7.0
Plumhill	62	8	29.1	2.11	5.8
Rantoul	46	− 5	21.3	1.54	8.3
Raum	65	9	32.4	1.54	4.4
Riley	34	−11	12.9	1.69	14.0
Robinson	58	5	27.5	2.00	8.5
Roundgrove	36	− 9	11.8	0.63	6.3
Rushville	47	− 3	23.4	1.21	9.3
St. Charles [e]	36	−16	13.6	0.88	8.8
St. John	70	8	33.0	1 83	1.0
Shobonier	56	4	28.0	1.86	7.5
Strawn	45	−11	18.8	1.18	8.5
Streator	42	−12	17.4	1.40	.....
Sullivan	41	0	22.4	2.15	10.0
Sycamore	36	− 11	13.0	1.19	11.9
Tilden	62	8	30.4	1.96	3.5
Tiskilwa	37	− 7	15.2	1.83	15.5
Tuscola	54	0	23.6	2.20	8.4
Walnut	38	−11	16.8	1.25	12.3
Wheaton [e]	.....	− 6	13.4	1.68	28.0
Winchester	50	3	24.8	1.60	9.0
Winnebago	36	−12	13.0	1.47	16.5
Yorkville	37	−20	12 8	1.26	12.2
Zion	40	− 7	15.6	1.60	16.0
Indiana.					
Anderson	49	2	25.2	1.44	6.3
Angola	33	− 4	16.0	1.93	18.4

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Indiana—Cont'd.	°	°	°	*Ins.*	*Ins.*
Auburn	36	−13	15.9	1.44	.....
Bloomington	53	4[d]	23.3	2.15	10.0
Bluffton	41	− 6	19.2	0.93	3.5
Bright	49	4	25.7	1.45	6.5
Butlerville	58	5	26.2	1.98	6.2
Cambridge City	48	− 2	22.4	1.29	2.2
Columbus	57	4	26.7	1.94	3.5
Connersville	50	0	23.4	1.64	4.3
Crawfordsville	49	7	21.6	1.40	T.
Delphi	48	− 5	18.6	1.57	6.4
Edwardsville [e] [1]	60	9	30.7	1.37	3.5
Fairmount	46	− 2	19.2	1.36	5.2
Farmland	46	1	22.8	1.42	5.5
Fort Wayne	39	−10	16.6	1.74	13.5
Franklin [e] [1]	53	6	26.9	1.21	8.7
Greencastle	49	1	24.0	1.90	10.7
Greensburg	48	2	21.8	2.63	6.0
Hammond	39	−10	17.0	2.30	2.3
Hector	44	0	21.2	1.20	1.0
Huntington	40	− 4	18.3	1.47	11.5
Jeffersonville	62	13	31.6	1.15	1.0
Knightstown	49	1	23.2	1.24	6.0
Kokomo	41	0	21.4	1.53	6.7
Lafayette	47	− 4	20.3	2.17	8.0
Laporte	37	− 6	17.7	2 25	18.5
Logansport	43	− 5	21.8	1.59	8.2
Madison *a*	50	7	28.0	1.51	2.5
Madison *b*	.....	.....	.....	1.03	T.
Marengo	63	6	28.2	2.13	4.1
Marion	47	− 1	20.9	1.53	8.6
Markle	43	− 6	18.2	0.60	6.0
Mauzy	49	0	22.8	1.92	6.6
Mount Vernon	68	10	32.2	0.80	T.
Northfield	47	− 3	21.3	1.50	8.5
Paoli	62	4	28.6	1.75	6.5
Peru	43	− 3	22.2	1.39	7.0
Prairie Creek	58	6	27.4	0 50	.....
Princeton	61	9	28.6	2.00	4.0
Rensselaer	60	− 1	20.6	1.27	12.8
Richmond	46	− 1	23.0	1.31	2.0
Rockville	52	− 1	23.0	1.56	6.0
Salem	63	4	28.7	1.65	4.8
Scottsburg	60	9	29.6	1.95	3.3
Seymour	53	5	25.6	2.30	7.5
Shelbyville	54	5	25.4	1.40	7.5
South Bend	36	− 8	16.2	1.88	19.0
Syracuse	36	−12	15.0	2.68	30.0
Terre Haute	57	3	25.6	1.59	2.3
Valparaiso	33	− 8	15.2	2.10	21.0
Veedersburg	51	− 1	22.2	1.39	2.5
Vevay	60	8	25.9	2.98	10.8
Vincennes	61	8	27.4	2.18	7.0
Washington	60	6	27.0	2.32	1.0
Winamac	.....	.....	.....	1.65	16.5
Worthington	58	5	25.5	2.23	8.0
Indian Territory.					
Bengal	72	16	40.8	1.45	0.5
Chickasha	70	15	38.0	0.55	0.8
Claremore	72	15	39.4	0.41	2.1
Colbert	.....	.....	.....	2.00	6.0
Fairland	66	14	36.4	1.67	1.0
Hartshorne	75	16	41.7	0.88	T.
Healdton	70	8	40.6	1.95	10.0
Lehigh	72	15	41.4	1.30	3.3
Marlow	70	12	40.2	0.74	2.0
Muscogee	70	15	38.5	1.11	T.
Pauls Valley	70	15	40.5	0.79	2.0
Roff	72	.....	.....	1.60	4.0
South McAlester	72	18	41.2	0.94	3.8
Tahlequah	67	10	38.4	2.05	2.5
Tulsa	.....	.....	.....	1.07	.....
Wagoner	69	12	37.7	1.30	4.0
Webbers Falls	70	17	40.2	1.14	0.2
Iowa.					
Afton	43	− 9	19.7	1.10	11.0
Albia	43	− 7	20.9	2.35	23.5
Algona	40	− 5	16.7	0.80	6.5
Alta *a*	42	− 8	17.4	0.49	4.0
Amana	39	−18	15.1	1.69	15.0
Ames *b*	40	−14	18.0	0.90	7.0
Atlantic	46	−13	19.4	1.70	16.0
Audubon	48	−10	18.3	0.23	2.2
Bancroft	42	− 7	17.2	0.80	6.0
Batavia	.....	.....	.....	1.00	10.0
Baxter	44	−10	15.2	1.18	.....
Bedford	49	−17	20.4	0.84	10.2
Belknap	39	− 8[d]	19.0[f]	2.00	20.0
Belleplaine	40[d]	−13	16.0	1.90	14.0
Bonaparte	42	−12	19.2	1.17	11.5
Britt	40	− 7	15.4	0.51	3.1
Buckingham	.....	.....	.....	1.20	10.5
Burlington	47	− 5	21.0	1.66	15.5
Bussey	.....	.....	.....	1.25	12.5
Carroll	44	− 6	20.0	0.75	6.5
Cedar Rapids	39	−18	15.2	1.84	16.1

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Iowa—Cont'd.	°	°	°	*Ins.*	*Ins.*
Centerville	44	− 7	20.9	1.50	15.0
Chariton	44	− 8	19.8	1.13	11.3
Charles City	37	−14	13.2	0.79	4.0
Clarinda	48	−10	22.0	1.42	16.1
Clearlake	39	− 8	14.6	0.70	7.0
Clinton	39	−12	14.8	1.40	14.0
College Springs	47	− 6	21.3	0.98	9.8
Columbus Junction	40	− 6	17.4	1.23	15.0
Coon Rapids	44	− 5	20.0	0.83	8.0
Corning	42	−11	19.7	1.40	14.5
Council Bluffs	47	− 2	22.8	1.06	10.2
Cresco	36[e]	−11[e]	11.2[e]	0.77	7.7
Cumberland	.....	.....	.....	1.50	15.0
Danville	.....	.....	.....	1.00	10.0
Decorah	39	−16	11.8	0.83	9.0
Delaware	37	−13	11.8	0.55	5.5
Denison	43	− 9	18.0	0.72	4.8
Desoto	42	− 6	20.6	1.45	14.5
Dows	40	−11	15.2	1.00	7.5
Eldon	43	−20	18.2	0.68	13.4
Elkader	41	−18	13.8	0.85	8.0
Emerson	.....	.....	.....	2.00	.....
Estherville	48	−15	15.6	1.00	10.0
Fayette	37	−17	12.3	0.66	6.6
Fonda	.....	.....	.....	0.49	1.5
Forest City	40	− 8	14.4	0.70	6.0
Fort Dodge	41	− 8	18.0	0.40	4.0
Fort Madison	.....	.....	.....	1.04	12.0
Fruitland	40	−19	15.8	1.50	11.5
Galva	45	− 6	18.6	0.90	9.0
Gilman	.....	.....	.....	1.64	14.0
Glenwood	46[e]	− 7	22.0	0.70	7.0
Grand Meadow	30	− 5	12.4	0.35	3.5
Greene	41	− 9	15.6	0.51	3.2
Greenfield	44	− 6	20.8	1.05	10.9
Grinnell	38	− 3	17.4	0.68	.....
Grinnell (near)	38	−11	16.7	1.24	16.8
Grundy Center	40	−10	15.6	1.10	9.0
Hamburg	.....	.....	.....	0.40	4.0
Hampton	42[b]	− 8	17.0[d]	0.98	9.1
Harlan	44	−10	19.2	1.05	10.3
Hawkeye	.....	.....	.....	0.90	9.0
Hedrick	41[d]	−11	17.8	0.74	7.4
Hopeville	42	− 7	20.0	0.84	.....
Hoprig	.....	.....	.....	0.20	1.5
Humboldt	40	− 8	17.8	0.50	4.1
Independence	37	−13	12.8	0.90	9.0
Indianola	41[d]	− 6	19.5	1.57	14.7
Iowa City	41	−21	14.6	1.97	17.0
Iowa Falls	37	−17	14.5	1.30	11.5
Keosauqua	46	− 7	21.8	1.21	12.5
Knoxville	44	−10	18.2	0.90	10.0
Lacona	.....	.....	.....	1.60	15.0
Lansing	40[e]	−11	15.8	1.08	10.8
Larchwood	48	− 9	17.9	0.40	1.5
Larrabee	45	−10	17.4	0.46	4.3
Leclaire	.....	.....	.....	1.52	19.5
Lemars	48	− 7	18.2	0.63	6.0
Lenox	42	− 8	19.7	0.47	4.7
Logan	46	− 9	20.6	0.90	9.0
Maquoketa	39	−18	14.2	1.25	11.0
Marshalltown	42	−12	18.2	1.17	11.9
Monticello	40	−14	15.2	0.63	11.5
Mooar	44	−12	20.2	1.02	.....
Mountayr	43	− 7	20.2	1.52	14.5
Mount Pleasant	42	−12	19.0	0.48	4.8
Mount Vernon *b*	40[f]	−10	16.0[e]	1.23	13.9
Murray	.....	.....	.....	0.12	1.2
New Hampton	35	−10	12.6	0.80	8.0
Newton	41	−15	17.6	1.80	19.0
Northwood	41	−10	15.4	0.70	7.0
Odebolt	43	− 7	19.4	0.53	6.2
Ogden	42	−15	17.0	0.60	4.6
Olin	40	−18	13.2	1.34	14.0
Onawa	47	− 5	21.9	0.87	10.2
Osage	36	− 9	12.6	0.95	8.3
Oskaloosa	42	−17	18.0	1.38	12.2
Ottumwa	46[f]	−10	21.0[e]	1.60	16.9
Ovid	45	−11	19.4	1.58	15.2
Pacific Junction	48	− 8	22.6	0.44	4.4
Pella	46	−12	16.6	1.40	14.0
Perry	42	− 8	19.5	1.20	12.0
Plover	40	−10	17.4	0.35	3.0
Redoak	45	− 9	19.9	0.80	8.0
Ridgeway	39	− 6	15.8	1.67	9.9
Rockwell City	42[e]	−10	18.8	0.70	6.0
Ruthven	43	− 8	15.1	3.00	30.0
Sac City	40	− 8	18.8	0.51	4.8
Scranton	40	− 4	19.4	0.30	4.0
Sheldon	44	−10	15.3	0.63	3.3
Sibley	46	− 7	16.8	0.64	2.1
Sigourney	42	−12	19.0	1.91	16.5
Sioux Center	45	−10	18.3	0.75	6.5
Spirit Lake	48[e]	− 5[d]	17.2[e]	0.25	2.5
Storm Lake	42	− 9	17.4	0.53	4.2
Stuart	45[e]	− 5	18.6	0.80	8.0

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Iowa—Cont'd.	°	°	°	*Ins.*	*Ins.*
Thurman	47	−13	22.0	1.35	14.0
Toledo	42*	−15	17.0*	1.30	13.0
Villisca	46	−10	20.6	1.15	11.0
Vinton *1	39	− 5	15.8	1.50	15.0
Wapello	45	− 7	19.1	0.83	14.5
Washington	41	−13	17.5	1.80	.....
Washta	.....	.....	.....	0.90	7.0
Waterloo	40	−13	15.9	1.06	11.0
Waverly	39	−15	15.1	0.97	7.0
Westbend *1	40	− 8	16.2	0.43	3.3
Westunion	.....	.....	.....	0.80	8.0
Whitten	40*	−12*	16.7*	0.90	9.0
Wilton Junction	41	− 15	15.4	2 06	19.5
Winterset	43*	− 7	19.3	1.20	12.0
Woodburn	.....	.....	.....	1.03	10.0
Kansas.					
Achilles	65	−16	24.0	0.95	9.0
Altoona	67	9	31.0	1.36	0.8
Anthony	.....	.....	.....	1.06	1.0
Atchison *a*	51	− 8	24.4	1.75	21.5
Beloit	58	−12	22.7	1.31	13.1
Burlington	63	− 2	29.8	1.52	6.0
Chanute	67	− 9	33.6	1.67	0.7
Colby	64	−13	24.8	0.81	7.8
Columbus	62	12	33.0	1.42	3.0
Coolidge	64	−10	28.0	0.60	6.0
Delphos	60	− 9	24.4	1.00	9.5
Dresden	65	− 9	25.6	0.85	8.5
Ellinwood	70	− 7	26.6	2 23	17.8
Emporia	60	0	27.8	1.20	12.0
Englewood	74	4	33.8	0.22	T.
Eureka	.....	.....	.....	1.20	5.5
Eureka Ranch	69	−10	26.4	0.65	6.5
Fallriver	66	8	31.7	1.33	T.
Fort Leavenworth	53*	1*	26.0*	2.27	22.7
Frankfort	54	− 9	25.2	1.10	11.0
Garden City	70	− 6	29.0	0.55	4.0
Gove *1	58	− 7	28.4	0.60	6.0
Grenola	67	8	32.2	1.30	T.
Harrison	59	− 9	24.2	1.14	10.0
Horton	50	− 5	24.6	1.66	16.0
Hoxie	66	−12	25.9	1.00	10.0
Hutchinson	68	− 5	28.6	1.40	14.0
Independence	67	12	34.2	1.29	0.2
Jetmore	70	− 6	29.0	1.36	8.5
Lakin	69	− 5	30.0	0.62	6.0
Lawrence	57	− 4	27.0	1.80	15.0
Lebanon	58	−12	23.6	1.20	12 0
Lebo	60	1	27.8	1.82	8.5
Leoti	68	− 3	24.8	0.45	4.5
Little River	66	− 6	27.1	1.60	15.5
Macksville	70	− 8	26.6	1.40	14.0
McPherson	65	− 8	25.4	2.53	25.5
Madison	65	1	29.0	1.13	7.0
Manhattan *c*	53[1]	−13	26.8[1]	1.98	20.8
Marion	60*	−15*	25.5*	2.55	15.0
Medicine Lodge	72	− 5	33.4	0.66	1.8
Minneapolis	60	−10	23.6	1.08	10.5
Moran	59	6	29.7	1.50	6.0
Mounthope *1	64	2	30.4	1.38	5.5
Ness City	68	− 4	30.2	1.09	10.2
Newton	66	− 2	28.0	0.95	8.5
Norwich	70	3	31.7	0.59	T.
Oberlin	.....	.....	.....	1.00	9.0
Olathe	58	− 6	27.1	1.10	11.0
Osage City	58	−11	26.6	1.31	12.1
Osborne	.....	.....	.....	1.30	13.0
Oswego	65	12	34.6	1.48	T.
Ottawa	59	− 1	28.0	1.61	7.8
Phillipsburg	.....	− 8	.....	1.20	12.0
Pratt	71	− 3	30.6	1.00	10.0
Rome	71	9	33.0	1.00	1.0
Salina	61	− 8	24.7	1.42	13.0
Scott	69	−14	27.2	0.50	5.0
Sedan	67	9	32.9	2.53	T.
Seneca	51	− 7	24.2	1.12	10.0
Toronto	66	6	29.5	1.50	3.5
Tribune	66	−12	26.2	0.50	5.0
Ulysses	78	− 7	29.4	0.55	5.5
Valley Falls	54	−10	24.4	2.10	21.0
Viroqua	70	− 4	31.2	0.60	6 0
Wakeeney (near) *1	60	− 8	25.6	0.70	7.0
Wamego *1	55	− 8	24.7	1.63	16.3
Yates Center	65	4	29.4	1.15	3.5
Kentucky.					
Alpha *2	.....	.....	.....	1.41	T.
Anchorage	64	8	30.1	0.96	1.5
Bardstown	67	10	32.6	0.85	1.5
Blandville	69	10	33.4	2.58	4.2
Berea	64	6	31.9	0.70	2.3
Bowling Green	66	14	34.2	1.15	2.0
Burnside	67*	11*	36.4*	1.27	0.7
Catlettsburg	56	1	29.8	1.14	T.
Centertown	70	9	33.6	0.40	T.
Earlington	70	10	34.0	1.17	2.5
Edmonton	64	12	34.0	1.11	1.5
Kentucky—Cont'd.					
Eubank	63	6	29.6	1.55	2.5
Falmouth	.....	.....	.....	1.68	6.5
Fords Ferry	69	5	33.4	1.34	T.
Frankfort	62	12	32.3	1.22	1.2
Franklin	60	14	34.9	1.56	1.6
Georgetown	60	10	30.8	.....	.....
Greensburg	66	12	31.9	0.93	0.5
Henderson	63	13	32.2	1.52	0.7
Hopkinsville	65	11	36.6	1.31	3.7
Irvington	65	9	30.8	0.92	0.2
Jackson	62	12	32.2	0.87	1.2
Leitchfield	65	11	31.0	1.14	1.6
Loretto	65	7	32.6	0.60	T.
Manchester	64	12	35.0	0.40	2.0
Marrowbone	63	11	32.0	0.70	T.
Maysville	58	6	28.2	1.50	3.0
Mount Sterling	51	9	30.3	0.89	1.0
Owensboro	69	11	33.8	1.42	0.5
Owenton	.....	7	.....	1.61	4.2
Paducah *a*	.....	.....	.....	2.37	4.0
Paducah *b*	71	13	35.4	2.28	4.7
Richmond	58	5	32 2	1.46	2.5
St. John	65	10	31.8	1.08	T.
Scott	55	6	27.3	1.55	9.2
Shelby City	64	9	30.2	0.58	2.0
Shelbyville	63	10	30.8	2.03	8.7
Warfield	63	9	30.2	1.01	1.0
Williamsburg	65	15	34.8	0.91	0.1
Louisiana.					
Abbeville	81	25	53.7	4.50	1.0
Alexandria	80	24	50.6	6.77	0.8
Amite	78	24	51.0	5.74	0.8
Baton Rouge	78	26	50.2	5.84	
Burnside	77	27	52.4	6.03	T.
Calhoun	77	19	44.9	5.05	2.0
Cheneyville	80	27	48.6	5.91	0.5
Clinton	81	24	50.7	6.35	1.0
Como	.....	.....	.....	7.02	3.0
Covington	75	24	49.8	5.38	0.5
Donaldsonville	78	26	52.2	6.30	T.
Emilie	74	29	51.8	5.33	T.
Farmerville	77	18	46.6	3.80	4.0
Franklin	75	26	51.6	6.23	
Grand Coteau	80	27	51.0	5.33	0.3
Hammond	78	25	52.4	5.37	0.5
Houma	76	28	53 6	4.97	T.
Jeanerette	81	22	53 5	7.00	
Jennings	80	27	50.2	4.16	
Lafayette	80	26	50.8	4.58	T.
Lake Charles	72*	29	49.2*	8.62	T.
Lake Providence	85	18	49.2	5.36	7.0
Lawrence	77	30	52.2	5 31	
Libertyhill	80	20	48.0	5.75	3.0
Mansfield	80	19	46.4	5.44	0.1
Melville	83	24	50.2	5.20	0.8
Minden	80	17	45.2	3.67	1.0
Monroe	78	23	47.3	4.05	2.0
New Iberia	77	27	52.8	6.05	T.
Oakridge	78	16	44.6	3.72	2.0
Opelousas	78	28	49.6	4.56	T.
Oxford	78	20	47.7	5.55	1.6
Paincourtville	77	28	51.9	6.98	
Plain Dealing	77	10	44.2	2.45	5.0
Prevost	.....	.....	.....	3.65	T.
Rayne	.....	.....	.....	4.23	T.
Robeline	77	18	45.2	7.95	.....
Ruston	77[1]	18[1]	46.8[1]	4.59	3.2
Schriever	79	25	51.9	6.58	
Southern University	76	27	50.4	5.85	
Sugar Ex. Station	76	31	51.8	6.27	
Sugartown	78	28	51.8	3 66	1.5
Venice	78	31	56.0	5.78	
Wallace	78	29	52.6	5.58	T.
White Sulphur Springs	80	.....	.....	9.05	3.5
Maine.					
Bar Harbor	38	− 6	18.6	1.63	17.3
Belfast *6	38	− 5	15.0	2.16	20.0
Bemis	32	− 6	11.6	1.20	11.0
Calais	36	−12	14.9	1.80	24.0
Carmel	35	−20	14.6	1.90	19.0
Cornish	39	2	17.9	1.26	12.2
Fairfield	41	−18	15.4	1.95	20.0
Farmington	39	−18	14.6	1.04	10.5
Flagstaff	35	−21	11.8	1.50	15.0
Gardiner	42	−11	16.6	1.76	17.8
Kineo	27	−22	8.9	1.80	18.0
Lewiston	45	−13	16.1	1.15	13.5
Mayfield	46	− 7	16.9	1.20	12.0
North Bridgton	42	−12	17.6	1.70	17.0
Orono	40	−18	14.0	1.95	19.5
Rumford Falls	36	−14	13.0	0.74	8.0
Winslow	39	−15	17.8	0.65	16.0
Maryland.					
Annapolis	52	12	30.6	1.50	.....
Bachmans Valley	44	0	23.4	1.11	3.0
Boettcherville	50	6	28.0	0.68	2.5
Maryland—Cont'd.					
Boonsboro *a*	54	7	26.8	0.57	3.0
Charlotte Hall	61	10	31.8	0.10	T.
Chase	43	3	25.6	0.10	1.0
Chestertown	49	12	30.2	1.35	0.5
Chewsville	52	2	26.0	0.63	4.0
Clearspring	50	7	26.1	0.57	5.8
Coleman	.....	.....	.....	0.79	2.5
Collegepark	57	7	28.0	0.90	T.
Cumberland *b*	.....	.....	.....	0.54	1.0
Darlington	46*	6*	25.8*	0.67	7.0
Deerpark	47	− 6	19.8	1.80	18.0
Denton	52	12	28.5	0.22	0.5
Easton	53	14	29.6	0.31	T.
Fallston	47	8	26.4	0.80	1.5
Frederick	50	6	29.6	0.80	2.2
Grantsville	46	2	20.8	0.80	7.5
Greatfalls	55	7	26.8	0.49	.....
Greenspring Furnace	50	6	26.9	0.60	1.3
Hancock	56	3	27.0	0.43	1.8
Harney	.....	.....	.....	0.90	3.0
Jewell	56	14	30.0	0.65	T.
Johns Hopkins Hospital	49	11	28.4	0.40	0.5
McDonogh	43	6	23.9	0.09	0.9
Mount St. Marys Coll	45	10	26.4	0.20	2.0
Newmarket	51	6	26.6	0.77	1.8
Pocomoke	53	7	31.8	0.85	3.0
Prince Fredericktown	56	12	30.4	0.47	1.0
Princess Anne	54	3	29 8	0.89	2.4
Rockhall *b*	56	11	29.8	0.31	.....
Sharpsburg	69	10	30.5	0.63	5.2
Solomons	56	18	32.2	0.37	0.7
Sudlersville	55	9	29.0	0.64	.....
Sunnyside	45	− 5	18.6	2.39	21.0
Takoma Park	55	10	28.0	0.76	.....
Taneytown	54	7	27.1	0.91	2.8
Van Bibber	47	11	26.4	0.85	.....
Westminster	47	8	24.4	0.90	1.0
Woodstock	51	8	27.7	0.53	3.0
Massachusetts.					
Amherst	44	− 1	20.0	0.56	6.5
Bedford	45	6	22.4	1.18	12.0
Bluehill (summit)	43	6	20 4	1.04	9.1
Cambridge	46	7	22.9	1.16	.....
Chestnuthill	46	5	22.8	0.77	7.5
Cohasset	.....	.....	.....	0.87	11.0
Concord	45	0	20.0	1.17	12.0
East Templeton *1	40	5	16.9	0.74	11.0
Fallriver	43	9	23.7	0.80	6.0
Fitchburg *a* *1	43	4	19.0	0.77	10.0
Fitchburg *b*	42	5	19.9	0.75	9.0
Framingham	44	6	22.2	1.49	13.0
Groton	44	4	19.8	0.72	10.5
Hyannis *1	39	10	23.6	1.20	7.5
Jefferson	.....	.....	.....	1.39	14.0
Lawrence	43	− 2	20.3	0.25	3.2
Leeds	43	− 4	18.2	0.55	5.5
Leominster	.....	.....	.....	0.77	8.5
Longplain	.....	.....	.....	1.02	8.0
Lowell *a*	42	− 1	21.8	1.06	.....
Lowell *b*	45	− 2	21.1	.....	.....
Ludlow Center	40	0	17.8	0.69	8.0
Middleboro	42	− 1	21.4	1.20	8.0
Monson	43	− 1	20.3	1.10	11.0
New Bedford *a*	49	9	25.2	1.26	11.6
Pittsfield	40	− 4	15.8	0.78	9.0
Plymouth *1	48	10	24.2	1.35	7.5
Princeton	.....	.....	.....	0.98	10.5
Provincetown	43	12	25.8	0.67	8.2
Somerset *1	46	5	22.2	1.22	9.0
Springfield Armory	47	6	21.6	0.63	5.0
Sterling	.....	.....	.....	0.96	9.0
Taunton *c*	41	− 2	21.3	1.16	.....
Webster	.....	.....	.....	1.06	9.0
Westboro	46	0	21.6	1.00	10.5
Weston	46	7	22.6	1.61	14.4
Winchendon	.....	.....	.....	0.85	10.5
Worcester	43	6	20.8	0.67	9.0
Michigan.					
Adrian	34	−15	13.4	1.31	13.0
Agricultural College	35	−18	12.8	1.83	18.3
Allegan	37	−12	16.6	1.05	10.5
Alma	34	−12	13.8	1.23	14.0
Ann Arbor	33	− 4	15.4	2.22	23.4
Annpere	38	−22	16.0	2.60	26.0
Arabela	35	−12	15.2	1.50	15.0
Baldwin	33	−21	13.7	1.00	10.0
Ball Mountain	35	− 6	14.2	3.18	31.6
Baraga	44	−10	11.4	.....	.....
Battlecreek	33	− 9	16.3	1.84	17.6
Benzonia	29	− 1	17.0	2.51	25.5
Berlin	34	− 9	13.8	1.92	19.2
Berrien Springs	35	− 5	17.0	4.60	48.0
Big Rapids	31	−15	14.0	1.50	15.0
Birmingham	35	− 6	15.5	1.66	16.6
Boon	30	−15	10.8	2.22	22.2
Calumet	35	− 2	12.2	1.20	15.0

TABLE II.—*Climatological record of voluntary and other cooperating observers.*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Michigan—Cont'd.	°	°	°	*Ins.*	*Ins.*
Carsonville	32	— 8	13.2	1.45	14.5
Charlevoix	36	—10	18.2	2.80	28.0
Chatham	37	— 5	15.4	0.45	4 5
Cheboygan	33	—12	14-1	0.50	5.0
Clinton	34	—10	15.1	1.20	12 8
Coldwater	34	—12	15.1	1.75	17.5
Deerpark	34	—11	14.6	1.19	11.9
Detour	32	—11	12.6	0.95	9.5
Dundee	35	— 9	15.5	0.79	7.9
Eagle Harbor	40	0	13.8	1.20	12.0
East Tawas	39	6	19.0	1.10	11.0
Eloise	35	— 7	15.1	1.44	14.7
Fairview	34	— 6	14.6	2.13	21.3
Fitchburg	34	—16	14.0	1.90	19.0
Flint	35	—21	13.2	1.64	16.4
Gaylord	29	—15	11.2	1.50	15.0
Gladwin	33	—12	13.9	0.65	6.5
Grand Rapids	31	0	17.7	2.30	23.0
Grape	35	— 9	16.0	1.74	17.9
Grayling	29	—21	11.1	1.20	12.0
Hanover	35	—13	14.3	1.95	19.5
Harbor Beach	34	— 5	15.5	0.62	6.2
Harrison	30°	— 5°	11.1°	0.60	6.0
Harrisville	40	— 5	15.6	0.77	7.7
Hart	33	—11	16.6	1 40	14.0
Hastings	36	—13	15.1	1.81	17.8
Hayes	30	—13	13.1	0.80	8.0
Highland Station	.....	.....	.....	1.80	18.0
Hillsdale	33	—13	14.1	2.63	26.5
Humboldt	25	—26	2.8	0.10	1.0
Ionia	33	—13	14.6	0.80	8.0
Iron River	32	—18	5.4	0.40	4.0
Ishpeming	35	—11	8.9	1.00	10.0
Ivan	29	—10	13.0	1.05	10.5
Jackson	34	— 9	15-8	1.90	19.0
Jeddo	33	— 8	14.2	1.10	11.2
Kalamazoo	33	— 6	16.9	2.71	27.0
Lake City	31	—19	13.4	1.80	18.0
Lansing	34	— 8	14.5	1.26	16.0
Lapeer	34	—13	13.6	1.60	16.0
Lathrop	33	—12	7.4	0.55	5.5
Lincoln	32	—16	11.7	1.20	12.0
Ludington	38	— 4	18.8	1.05	10.5
Mackinac Island	32	— 8	13.7	0.30	3.0
Mackinaw	30	—19	16.0	0.30	3.0
Madison	38	—12	15.8	0.74	7.4
Mancelona	30	—22	13.6	3.00	30.0
Manistee	30	— 6	18.7	2 00	20.0
Manistique	30	— 8	13.9	0.71	7.0
Menominee	37	— 6	14.6	0.80	8.0
Midland	34	0	19.4	1.90	19.0
Mount Clemens	35°	— 5°	17.0°	1.35	13.5
Mount Pleasant	31	—14	14 0	1.20	12.0
Muskegon	30	—12	17 0	1.70	17.0
Newberry	33	—22	11.2	1.60	16.0
North Marshall	39	—11	15.7	0.80	8.0
Northport	36	2	19.7	2.15	21.5
Old Mission	32	0	17 9	2.16	22.0
Olivet	32	— 4	15.7	1.94	19.4
Omer	33	—19	12.3	0.50	5.0
Onaway	31	—11	13.0	0.05	0.5
Ontonagon	33	— 7	7.2	0.60	6.0
Ovid	33	—15	13.8	2.25	22 5
Owosso	35	—17	14.8	1.80	18.0
Petoskey	30	—11	15.2	1.20	12.0
Port Austin	32	— 5	15.2	0.60	6.0
Reed City	30	—18	13.0	1.40	14.0
Roscommon	.....	.....	.....	0.20	2.0
Saginaw	35	— 8	16.2	1.49	14.9
St. Ignace	33	—12	14.6	0.10	1.0
St. Johns	35	— 3	16.6	1.40	14.0
St. Joseph	34	0	20.2	2.10	21.0
Sidnaw	36	—17	6.1	0.60	6.0
Somerset	32	— 8	13.0	1.00	10.0
South Haven	38	1	18.6	0.80	8.0
Stanton	30	— 7	14.2	1.80	18.0
Thornville	36	— 7	14.8	1.96	23.0
Traverse City	33	— 7	18.4	1.25	12.5
Vassar	32	—13	13.0	1.38	13.8
Wasepi	34	—15	13.9	2.45	24.5
Waverly	34	—13	14.5	1.61	13.7
West Branch	30	—10	13.5	1.11	11.1
Wetmore	32	—18	7.8	1.20	12.0
Whitecloud	30	—12	15.2	0.80	8.0
Whitefish Point	32	—10	11.4	1.71	17.1
Williamston	36	—17	15.0	2.45	24.5
Ypsilanti	37	—10	15.3	1.47	14.7
Minnesota.					
Ada	41	—26	4.5	0.42	4.3
Alexandria	42	—30	9.4	0.17	1.7
Ashby	43	—14	9 3	0.49	6 0
Beardsley	56°	—17°	12.2°	0.17	1.7
Beaulieu	43	—28	4.2	0.22	2.2
Bemidji	45	—36	6.2	0.35	4.0
Bird Island	47	—11	12.6	0.40	4.0
Blooming Prairie	41	—11	10.7	0.40	4.0
Brainerd	41	—30	5.8	0.27	2.7
Caledonia	54	—10	11.1	0.71	8.5
Collegeville	46	—12	12.4	0.17	2.6
Crookston	38	—24	6.0	0.40	4.0
Currie	50	— 7	13.2	.....	.....
Deephaven	.....	.....	.....	0.40	4.0
Detroit City	40	—35	0.8	0.37	3.5
Faribault	40	—13	12.2	0.36	5.8
Farmington	41	—14	11.4	0.40	5.0
Fergus Falls	41	—18	8.3	0.37	3.7
Glencoe	45	—12	12.4	0.15	T.
Grand Meadow	36	—13	9.0	0.75	9.0
Hallock	37	—36	2.2	0.44	4.5
Hovland	.....	.....	.....	0.28	4.8
Lake Jennie	46	—14	12.1	0.29	2.5
Lakeside	42	—14	12.1	0.40	4.0
Lake Winnibigoshish	42	—26	4.0	0.38	4.0
Leech	47	—27	5.4	0.22	2.0
Leroy	38	—14	10.5	1.00	.....
Long Prairie	42	—22	9.4	0.10	2.0
Luverne	48	— 8	17.8	0.22	2.2
Lynd	49	—12	15.2	0.37	3.5
Mapleplain	40	—17	10.8	0.42	4.6
Milan	52	—16	11.4	0.42	4.2
Minneapolis *a*	37	—15	9.5	0.36	3.6
Minneapolis *b*[1]	36°	—14	11.8	0.33	4.0
Montevideo	48	—14	14.4	0.58	5.4
Morris	46	—14	10.6	0.30	4.0
Mount Iron	44	—25	5.9	0.30	3.0
Newfolden	36	—27	0.9	0.32	3.9
New London	44	—22	8.2	0.02	1.8
New Richland *[1]	36	—10	14.9	.....	.....
New Ulm	49	— 8	13.0	0.25	5.2
Park Rapids	44	—25	5.2	0.22	2.2
Pine River	42	—26	5.2	0.44	4.8
Pipestone	45	—10	14.3	0.42	4.2
Pleasant Mounds	46	— 6	15.5	0.16	4.2
Pokegama Falls	38	—38	0.0	0.28	3.2
Redwing *a*	.....	.....	.....	0.69	5.0
Redwing *b*	35	—14	11.0	0.33	6.5
Reeds	.....	.....	.....	0.62	11.0
Rolling Green	45	— 6	14.0	0.80	8.0
St. Charles	40	—12	12.8	0.70	7.0
St. Cloud	40[f]	—16[f]	9.5[f]	T.	T.
St. Peter	49[h]	— 9	14.8[g]	0.43	7.0
Sandy Lake Dam	40	—25	5.0	0.34	4.6
Shakopee	40	—13	11.8	0.60	6.0
Thief River Falls	.....	.....	.....	0.55	5.0
Tower	39	—29	7.8	0.40	4.0
Two Harbors	39	—15	9.8	0.74	7.2
Wabasha *[1]	35	—10	12.5	0.64	8.0
White Bear	.....	.....	.....	0.26	4.2
Willmar	43	—12	10.6	0.33	3.0
Willow River	35	—26	7.6	0.28	3.6
Winnebago City	47	—16	12.4	0.42	4.2
Worthington	44	— 7	16.1	0.32	3.8
Zumbrota[1]	36°	—15	12.6	.....	.....
Mississippi.					
Agricultural College	72	18	42.6	5.63	7.8
Austin	73	18	42.5	2.39	T.
Batesville	70	18	42.4	2 25	1.5
Bay St. Louis	76	27	51.6	5.46	0.1
Biloxi	75	28	52.6	3.55	T.
Booneville	68	20	39.0	2.13	0.5
Brookhaven	80	18	48.2	6.95	.....
Canton	71	15	46.0	5.55	6.0
Cleveland	.....	.....	.....	2.72	2.0
Columbus *b*	70	24	41.8	4.61	9.0
Crystalsprings	76	20	45.2	5.22	4.0
Edwards	73	22	47.6	4.47	4.0
Fayette	75	23	46.4	6.50	2.0
Fayette (near)*[1]	70	27	49.4	5.80	2.0
Greenville *a*	73	25	46.3	3.82	4-2
Greenville *b*	75	22	43.8	3 91	4.0
Hernando	71	20	40.4	1.65	.....
Holly Springs	70	20	38.7	2.01	T.
Jackson	75	24	45.9	3.57	4.0
Kosciusko	64	18	44.8	6.40	5.0
Leakesville	75	20	48.7	6.76	1.5
Louisville	75	18	44.0	4.81	6.5
Macon	71	20	42.6	1.86	2.0
Magnolia	79	23	48.9	5.03	1.0
Natchez	80	25	49.1	6.20	T.
Okolona	70	21	42.9	2.25	2.5
Palo Alto	73	21	43.6	4.29	7.8
Pearlington	78	25	51.4	4.95	.....
Pontotoc	73	18	42.0	3.00	2.7
Poplarville	74	25	51.2	5.26	0.8
Port Gibson	79	23	47.8	4.97	0.8
Ripley	71	16	39.8	2.29	T.
Saratoga	79	14	48.4	4.99	0.5
Shoccoe *[b]	72	24	46.4	4.40	8.5
Suffolk	.....	.....	.....	5.33	1.4
Thornton	72	26	46.6	5.11	.....
Tupelo	.....	.....	.....	3.28	2.0
Walnutgrove	79	19	44.8	3.95	7.0
Watervalley	73	.....	.....	8.24	5.0
Waynesboro	74	17	47.3	3.40	5.0
Woodville	77	23	49.5	5.13	1.0
Yazoo City	74	20	45.2	3.97	5.0
Missouri.					
Appleton City	76	7	30.4	1.83	3.1
Arthur	59	5	30.9	1.31	1.5
Avalon	50	— 7	24.2	1.18	12.5
Bethany	47	—19	21.7	0.89	8.3
Birchtree	67	3	32.6	2.13	3.0
Boonville	.....	.....	.....	2.10	3.0
Brunswick	50	— 6	22.0	1.31	9.5
Conception	48	— 5	21.7	0.70	7.0
Cook Station	65	— 4	30.3	1.85	8.0
Cowgill *[b]	50	— 3	23.8	1.76	14.2
Darksville	46	— 5	22.0	0.80	6.5
Downing	.....	.....	.....	1.15	11.5
Edgehill *[b]	60	— 4	28.6	1.95	6.6
Edwards	63	— 1	30.6	1.76	5.0
Eightmile *[b]	.....	5	26.6	0.97	5.5
Eldon	57	5	29.6	2.59	7.0
Elmira	49	—15	23.4	2.08	21.0
Fairport	.....	5	26.6	1.16	11.9
Fayette	52	— 3	25.1	1.46	9.2
Fulton	56	6	28.6	1.37	3.0
Galena	.....	.....	.....	1.01	0.5
Gallatin *[1]	48	— 3	24.4	2.03	19.0
Gayoso	71	14	37.4	2.51	3.0
Glasgow	51	— 4	25.2	1.75	12.5
Gorin	.....	.....	.....	1.29	11.0
Halfway	64	6°	32.2	1.73	4.0
Harrisonville	55	0	25.0	1.57	6.8
Hazlehurst	.....	.....	.....	1.20	12.0
Hermann	.....	.....	.....	1.46	0.2
Houston	67	0	32.2	2.02	4-1
Houstonia (near)	.....	.....	.....	1.36	9.2
Irena	.....	.....	.....	1.55	12.0
Ironton	65	— 1	31.0	2.42	11.5
Jackson	.....	.....	.....	1.91	3.0
Jefferson City	57	9	28.8	2.23	3.0
Kidder	47	— 7	22.6	1.41	13.6
Koshkonong	70	11	35.3	1.94	4.0
Lamar	62	12	32.8	0.70	T.
Lebanon	60	2	31.2	1.90	3.5
Lexington	55	— 4	27.0	1.30	9.5
Liberty	52	—10	24.6	1.50	15.0
Louisiana	54	2	27.6	1.49	9.3
McCune *[1]	51	— 3	25.4	2.83	13.0
Macon	50	— 5	24.8	1.05	7.0
Marblehill	65	5	33.6	2.27	5.0
Marshall	48	— 7	24.4	1.19	5.9
Maryville	48	—10	30.6	1.55	15.5
Mexico	53	0	27.1	2.11	13.8
Miami *[b]	48	— 3	25.1	0.91	9.2
Mineralspring	63	15	34.8	1.77	0.2
Montreal	62	— 4	30.1	1.92	3.5
Mount Vernon	63	14	33.0	1.31	2.2
Neosho	64	12	34.8	1.17	2.0
Nevada	.....	.....	.....	1.86	3.0
New Haven	60	10	30.6	2.37	6.0
New Palestine	53	4	29.0	1.38	2.2
Oakfield	63	7	29.9	1.84	6.8
Olden	60	5	33.0	2.24	4.0
Oregon *a*	50	— 3	24.1	2.08	16.2
Palmyra *[b]	48	— 3	25.8	1.34	8.4
Phillipsburg *[1]	60	8	30.2	1.37	3.6
Pine Hill	.....	.....	.....	2.37	7.3
Poplarbluff	73	13	37.2	2.74	4.0
Potosi	65	2	26.8	2.33	10.0
Princeton	46	—12	22.2	2.23	20.0
Richmond	53	— 6	25.5	1.35	13.5
Rockport	.....	.....	.....	1.83	12.0
Rolla	.....	.....	.....	1.70	7.8
St. Charles	61	8	28.7	1.88	8.2
St. Joseph	.....	.....	.....	1.19	13.5
Sarcoxie *[b]	.....	11	29.1	1.74	1.0
Sedalia	55	— 1	28.6	1.06	2.0
Seymour	61	5	31.9	1.66	4.0
Shelbina	.....	.....	.....	0.95	8.0
Sikeston	70	13	35.2	5.04	3.5
Steffenville	45	— 8	23.0	0.85	8.0
Sublett	44	—15	21.0	2 11	18.5
Trenton	.....	— 6	.....	1.30	13.0
Vichy	63[f]	0°	30.0[f]	0.62[1]	4.2[1]
Warrensburg	52°	0°	28.7°	1.27	.....
Warrenton	56	6	26.1	1.87	4.5
Wheatland	.....	.....	.....	1.08	3.0
Willowsprings	65	— 8	32.6	2.05	6.0
Windsor	53	3	27.7	0.50	4.5
Wylie	67	10	35.5	1.62	0.3
Zeitonia	60	5	31.5	2.42	2.4
Montana.					
Adel	51	—21	18.1	0.50	4.0
Augusta	60	—19	20.8	0.12	4.8
Bigtimber	58	—25	21.6	0.26	5.0
Billings	65	—21	21.0	.....	.....

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Montana—Cont'd.	°	°	°	*Ins.*	*Ins.*
Boulder	55	−19	18.6	0.70	4.1
Bozeman	52	−13	20.4	0.55	5.5
Butte	50	−11	19.8	0.65	1.5
Canyon Ferry	53	−10	22.6	0.45	0.3
Chester	52	−18	12.4	T.	T.
Chinook	59	−12	15.6	0.17	1.7
Clemons	56	−21	19.2	2.44	19.9
Columbia Falls	54	− 8	23.4	2.40	7.5
Corvallis	57	5	28.0	0.63	6.0
Crow Agency	66	−23	21.0	0.16	6.0
Culbertson	49	−24	8.4	0.18	.....
Dell	50	−19	17.0	0.40	4.0
Dillon	58	−10	23.0	0.73	2.9
Ekalaka	59	−22	15.1	.....	.....
Fort Benton	51	−22	16.9	0.80	8.0
Fort Logan	50	−23	17.1	1.50	.....
Glasgow	60	−20	11.5	0.27	.....
Glendive	62	−19	15.6	0.93	6.0
Glenwood	53	−11	20.8	1.04	10.0
Greatfalls	56	−14	21.8	0.53	5.3
Kipp	57	−23	19.2	0.50	5.0
Lewistown	62	−20	19.0	0.02	0.2
Livingston	64	− 5	26.4	0.01	0.1
Manhat an	58	−15	22.7	0.03	
Martinsdale	54	−17	20.1	0.45	2.5
Marysville	48	−12	18.8	1.23	7.5
Missoula	51	− 1	24.8[d]	0.55	1.0
Ovando	52	−22	16.0	1.56	10.0
Parrot	57[m]	− 7	26.4[e]	0.10	0.7
Plains	53	3	27.4	0.70	2.0
Poplar	52	−26	10.0	0.50	3.0
Ridgelawn	54	−20	11.8	0.24	2.4
St. Pauls	55	−20	18.6	0.41	4.1
Troy	56	− 3	27.8	1.81	3.0
Twin Bridges	55	−10	21.4	.....	3.0
Utica	50	−15	19.6	0.20	....
Wibaux	48	−26	16.7	0.27	.....
Yale	66	−20	22.6	0.34	.....
Nebraska.					
Agee	.....	.....	.....	0.45	4.0
Albion	57	−12	20.6	0.50	5.0
Alliance	.....	.....	.....	0.70	7.0
Alma	55	−15	23.8	0.55	5.5
Ansley	58	20	20.0	1.50	15.0
Arapaho *[1]	65	−13	27.0	0.50	5.0
Arborville *[1]	70	−10	22.6	0.70	7.0
Arcadia	.....	.....	.....	1.20	12.0
Arlington	.....	.....	.....	0.50	5.0
Ashland *a*	50	− 4	24.0	0.42	4.0
Ashland *b*	.....	.....	.....	0.58	6.5
Ashton	.....	.....	.....	0.65	7.0
Auburn	51	−10	23.6	1.60	16.0
Aurora *[1]	52	− 8	23.3	0.82	.....
Bartley	.....	.....	.....	0.25	.....
Beatrice	51	− 7	23.4	0.75	7.5
Beaver	66	−14	25.1	0.67	6.7
Bellevue	.....	.....	.....	0.80	8.2
Benedict	.....	.....	.....	0.70	7.0
Benkleman	.....	.....	.....	0.40	4.0
Blair	46	− 3	20.5	0.39	6.0
Bluehill	.....	.....	.....	0.35	3.5
Brokenbow *[1]	60	−16	20.2	0.50	5.5
Burchard	.....	.....	.....	0.50	5.0
Burwell	.....	.....	.....	1.15	11.5
Callaway	58	−12	21.0	1.01	9.0
Camp Clarke	56	−25	17.4	1.20	12.0
Central City	.....	.....	.....	1.00	10.0
Chester	.....	.....	.....	0.81	8.1
Cody	.....	.....	.....	1.20	12.0
Columbus	48	− 6	21.6	0.64	9.0
Crete	52	− 7	23.1	0.65	6.5
Cuibertson	.....	.....	.....	0.35	3.5
Curtis	63	−19	22.7	0.80	8.0
David City	50	− 7	21.2	1.20	12.0
Dawson	53	− 6	24.8	0.81	.....
Eden	.....	.....	.....	1.10	11.0
Edgar *a*	.....	.....	.....	0.80	8.0
Ericson	.....	.....	.....	0.90	9.0
Ewing	.....	.....	.....	1.12	11.2
Fairbury	57	− 7	23.4	0.64	9.7
Fairfield	52	− 8	25.5	0.80	8.0
Fairmont	49	− 9	22.0	0.80	8.0
Fort Robinson	56	−15	20.6	1.16	6.6
Franklin	64	−15	21.6	1.00	10.0
Fremont	48	− 7	22.0	0.80	8.0
Geneva	55	−10	22.3	0.41	4.1
Genoa	54	− 7	20.9	0.58	8.2
Gering	57	−29	17.8	0.75	7.5
Gordon	.....	.....	.....	0.40	4.0
Gosper	.....	.....	....	0.80	8.0
Gothenburg	60	−20	20.1	0.90	9.0
Grand Island *a* *[1]	52	− 8	22.6	0.58	5.8
Grand Island *b*	55	−12	22.0	0.96	9.8
Greeley	.....	.....	.....	0.80	8.0
Guide Rock	.....	.....	....	1.25	12.5
Haigler	.....	.....	.....	0.30	3.0
Hartington	48	− 9	17.6	1.30	10.5
Harvard	55	−11	22.6	0.70	7.0
Hastings *[1]	56	− 7	23.4	0.60	6.0
Hayes Center	.....	.....	.....	0.80	8.0
Hay Springs	53[b]	−20[b]	20.8[b]	0.92	8.0
Hebron	58	− 7	24.2	0.74	7.4
Hickman	.....	.....	.....	0.37	3.7
Holdrege *[1]	58	−12	27.2	0.70	7.0
Hooper *[1]	45	− 4	21.7	0.36	6.5
Imperial	60	−20	23.5	0.34	.....
Johnstown	.....	.....	.....	1.32	13.2
Kearney	.....	.....	.....	0.32	3.2
Kennedy	56	−18	20.4	1.15	11.5
Kimball	55	−19	21.2	1.43	11.5
Kirkwood *[1]	55	−14	18.6	0.95	9.5
Laclede	54	−12	20.7	0.87	9.5
Lena	.....	.....	.....	1.15	8.6
Lexington	62	−19	21.4	1.00	10.0
Lodgepole	58	−21	19.8	0.80	8.0
Loup	.....	.....	.....	0.55	11.0
Lynch	58	−20	19.8	0.60	6.0
Lyons	.....	.....	.....	1.03	10.3
McCook *[1]	60	−14	22.8	0.40	4.0
Madison	50	− 4	21.6	0.65	7.2
Madrid	.....	.....	.....	0.70	7.0
Marquette	.....	.....	.....	0.80	8.0
Mason City	.....	.....	.....	1.00	10.0
Merriman	.....	.....	.....	1.15	11.5
Minden *a*	57	−12	21.8	1.68	7.7
Monroe	.....	.....	.....	0.43	6.6
Nebraska City *b*	.....	.....	.....	0.90	9.0
Nebraska City *c*	50	− 5	23.2	0.50	.....
Nemaha *[1]	54	− 6	26.9	1.15	11.5
Nesbit	56	−19	19.7	1.05	9.5
Norfolk	49	−13	19.2	0.25	3.7
North Loup	55	−18	21.0	1.05	10.5
Oakdale	54	−11	19.6	0.33	3.9
Odell	.....	.....	.....	0.70	7.0
O'Neill	60	− 2[c]	24.1	1.10	11.0
Ord	.....	.....	.....	0.81	.....
Osceola	.....	.....	.....	0.80	8.0
Ough	.....	.....	.....	0.45	4.5
Palmer	.....	.....	.....	0.70	7.0
Palmyra *[1]	50	− 4	22.4	0.57	7.5
Plattsmouth *a*	.....	.....	.....	0.75	7.5
Pleasanthill	.....	.....	.....	0.62	6.2
Ravenna *a*	56	−14	20.4	0.90	9.0
Ravenna *b*	.....	.....	.....	1.30	13.0
Redcloud *b* *[1]	58	−13	23.4	0.90	9.0
Republican *[1]	58	−18	20.0	0.30	3.0
St. Libory	.....	.....	.....	0.80	8.0
St. Paul	57	−14	21.2	0.85	8.5
Salem *[1]	52	−10	25.2	1.20	12.0
Santee	56	− 7	21.0	0.61	7.4
Schuyler	.....	.....	.....	1.00	10.0
Seneca *[1]	58	−10	19.0	0.70	7.0
Seward	.....	.....	.....	0.80	8.0
Smithfield	.....	.....	.....	1.50	.....
Spragg	.....	.....	.....	0.68	10.0
Springview	56	−15	20.0	1.10	11.0
Stanton *[1]	50	− 8	18.4	0.50	5.0
State Farm	51	− 6	23.6	0.95	9.5
Strang	.....	.....	.....	1.00	10.0
Stratton	.....	.....	.....	0.90	8.0
Superior	.....	.....	.....	0.80	8.0
Syracuse	.....	.....	.....	0.95	9.5
Tablerock	.....	.....	.....	1.48	16.5
Tecumseh *b*	46	− 5	21.6	0.50	5.0
Tecumseh *c*	.....	.....	.....	0.65	6.5
Tekamah	48	− 9	22.0	0.77	7.7
Turlington	51	− 4	23.0	1.18	11.8
Wakefield	49	−14	20.2	0.76	7.6
Wallace	.....	.....	.....	0.35	3.5
Wauneta	.....	.....	.....	0.80	8.0
Weeping Water	.....	.....	.....	1.13	10.7
Westpoint	50	− 7	22.1	0.43	3.0
Whitman	.....	.....	.....	0.90	9.0
Wilber *[1]	52	− 2	23.8	0.85	9.0
Willard	.....	.....	.....	1.09	4.8
Wilsonville *[1]	67	−14	22.4	0.70	7.0
Winnebago	.....	.....	.....	0.50	8.0
Wisner	.....	.....	.....	0.40	4.0
Wymore	.....	.....	.....	0.65	6.5
York	.....	.....	.....	1.40	14.0
Nevada.					
Austin	55	− 1	30.4	4.14	.....
Battle Mountain *[1]	60	− 5	31.7	3.70	9.0
Belmont	52	3	27.8	2.38	17.0
Beowawe *[1]	65	−10	34.8	3.05	14.0
Candelaria *[f]*	77	2	36.1	.....	.....
Carlin *[i]*	60	−12	27.2	1.90	12.0
Carson City	67	−10	34.2	2.93	16.4
Cranes Ranch	.....	.....	.....	2.40	.....
Elko (near)	61	−27	30.0	5.50	17.0
Ely	56	−14	30.2	1.40	7.0
Fenelon *[1]	61	− 3	25.2	1.10	11.0
Glenbrook	.....	.....	.....	5.10	20.0
Golconda *[1]	64	5	33.7	0.43	4.0
Halleck *[1]	60	−15	28.9	1.90	7.0
Hamilton	51	3	28.6	2.58	25.8
Hawthorne	68	10	37.2	0.45	....
Hot Springs *[1]	70	7	38.2	0.43	4.0
Humboldt *[1]	63	1	36.0	2.90	16.0
Lee	.....	.....	.....	4.49	14.5
Lewers Ranch	66	0	34.9	7.93	20.0
Lovelocks *[1]*	66	9	38.0	1.40	6.0
Mill City *[1]	60	0	33.4	3.73	16.5
Monitor Mill	54	− 9	39.2	1.11	10.9
Owyhee	58	− 1	29.4	1.89	6.4
Palisade *[1]	64	−20	29.0	2.46	9.5
Palmetto	70	−10	32.0	5.55	48.0
Potts	65	−20	25.8	0.35	4.5
Reno State University	54	− 6	30.3	3.24	26.6
Sodaville	64[j]	6	33.6[e]	0.69	4.0
Tecoma *[1]	60	0	28.4	0.90	9.0
Toano *[5]	40	− 8	30.9	1.39	13.5
Tuscarora	56	− 4	34.4	2.51	14.5
Tybo	56	8	31.0	4.00	36.0
Verdi *[1]	58	− 8	37.2	5.40	28.0
Wadsworth *[1]	72	− 2	32.5	1.18	8.3
Wells *[1]	60	− 8	28.0	3.70	13.0
Wood	55	−10	28.0	3.14	11.5
New Hampshire.					
Alstead	.....	.....	.....	0.47	4.8
Berlin Mills	40	−18	11.4	0.91	10.0
Bethlehem	38	− 8	11.3	1.50	15.0
Brookline *[1]	43	− 8	17.0	0.60	6.0
Claremont	41	−17	15.9	0.30	4.5
Concord	41	−12	16.8	0.47	7.4
Durham	44	5	19.2	0.79	9.5
Franklin Falls	41	− 3	17.4	0.56	5.8
Grafton	40	−23	12.0	0.60	6.0
Hanover	39	−16	14.6	0.39	3.2
Keene	43	−15	16.4	0.60	7.2
Littleton	34	− 6	11.0	1.39	13.4
Nashua	45	− 5	20.0	0.91	8.0
Peterboro	42	− 8	16.6	1.01	11.2
Plymouth	38	−16	14.1	0.42	4.6
Sanbornton	40	− 5	15.0	0.60	6.0
Stratford	37	−20	11.5	0.88	8.0
New Jersey.					
Asbury Park	47	10	26.6	1.27	5.2
Bayonne	45	11	25.9	0.72	3.8
Belvidere	46	5	24.4	0.98	8.8
Bergen Point	43	10	25.2	0.84	8.2
Beverly	49	7	27.2	0.97	3.5
Billingsport *[1]	45	10	26.7	1.02	0.8
Bridgeton	52	9	28.7	0.93	.....
Camden	45	9	26.4	0.80	2.6
Cape May C. H.	50	10	28.3	0.93	0.6
Charlotteburg	42	1	22.2	0.80	8.5
Chester	40	5	20.7	1.07	7.7
Clayton	48	5	25.7	0.84	1.0
College Farm	43	7	24.8	0.76	2.2
Deckertown	43	4	22.8	0.85	8.5
Dover	40	4	21.8	1.00	10.0
Egg Harbor City	28	9	26.2	1.14	1.5
Elizabeth	45	8	25.8	0.91	7.0
Flemington	45	7	25.6	0.92	5.2
Friesburg	49	6	26.7	1.00	0.8
Hammonton	.....	.....	.....	0.90	5.0
Hanover	45	5	23.5	0.80	7.0
Hightstown	45	7	25.0	1.51	5.0
Imlaystown	47	8	25.8	1.18	5.3
Lambertville	45	6	26.2	0.99	3.1
Layton	44	− 6	20.2	0.79	8.0
Moorestown	47	5	26.1	0.84	3.4
Mount Pleasant	.....	.....	.....	0.80	1.1
Newark	44	10	23.8	0.69	7.0
New Brunswick	47	8	26.4	0.98	4.9
Newton	40	6	21.6	0.78	8.0
Ocean City	48	7	26.6	1.02	0.5
Oceanic	43	8	26.0	1.05	3.7
Paterson	47	12	27.6	0.92	9.5
Perth Amboy	44	11	25.6	1.02	7.7
Plainfield	45	8	24.2	0.79	5.8
Rancocas	.....	.....	.....	0.78	3.1
Rivervale	48	− 6	24.7	0.70	7.0
Roseland	45	5	22.8	0.77	7.0
Salem	52	8	28.6	1.14	1.2
Somerville	47	5	25.7	0.90	6.0
South Orange	43	10	24.2	0.78	8.5
Toms River	48	4	25.2	1.65	3.0
Trenton	46	12	27.4	1.06	6.0
Tuckerton	49	7	26.4	1.22	4.8
Vineland	48	6	27.0	0.81	1.0
Woodbine	48	7	27.4	0.88	1.5
New Mexico.					
Albert	77	11	37.7	0.44	4.0
Albuquerque	67	20	41.1	0.69	3.0
Alma	75	14	41.9	1.02	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
New Mexico—Cont'd.	°	°	°	*Ins.*	*Ins.*
Bellranch	.....	.....	.....	0.81	4.0
Bernalillo	70	19	41.7	0.36	2.0
Bluewater	61	2	32.0	1.90	18.0
Cambray	.....	.....	.....	0.59	
Deming	.....	.....	.....	1.87	T.
East Lasvegas	58	13	34.8	0.70	7.0
Engle	78	18	43.0	1.07	
Espanola	65	7	37.6	0.22	1.0
Folsom	65	0	30.4	0.55	5.5
Fort Bayard	68	13	40.8	0.65	6.0
Fort Union	65	5	35.6	0.80	8.0
Fort Wingate	65	8	36.8	1.17	9.0
Gage	.....	.....	.....	0.99	
Galisteo	64	16	39.9	0.45	4.5
Gallinas Spring	68	0	36.3	0.74	7.2
Hillsboro	71	26	47.4	2.18	1.5
Horse Springs	64	8	34.4	0.58	.....
Las Vegas Hotsprings	67	9	34.6	0.85	7.9
Lordsburg	.....	.....	.....	0.50	3.0
Los Lunas	69	15	40.7	0.75	
Lyons Ranch	79	23	45.8	2.19	T.
Mesilla Park	81°	20°	47.8°	0.95	1.0
Olio	65	13	38.4	0.75	.....
Raton	66	5	32.8	0.80	8.0
Roswell	80	2	40.2	1.15	9.8
San Marcial	84	20	49 2	0.90	T.
Socorro	71	16	42.1	1.14	5.0
Springer	70	— 2°	34.0°	0.60	6.0
Strauss	.....	.....	.....	1.30	
Whiteoaks	67	13	39.1	2.53	17.0
Winsors Ranch	57	— 6	29.2	2.25	22.5
Woodbury	66	15	37.6	1.16	4.8
New York.					
Adams	.....	.....	.....	4.52	98.0
Addison	37	—10	17.8	0.71	7.5
Akron	.....	.....	.....	2.74	.....
Alden	38	— 3	15.9	2.51	24.6
Alfred	36	— 5	14.6	0.81	9.0
Angelica	37	—17	14.8	2.04	19.0
Appleton	34	0	18.6	0.74	.....
Atlanta	33	—16	14.3	2.54	23.5
Auburn	40	— 7	19.4	2.39	24.5
Avon	37	—11	16.0	1.21	17.9
Axton	32	—29	6.4	0.88	13.7
Baldwinsville	35	— 8	17.8	2.55	25.5
Bedford *a*	43	— 2	22.2	0.98	12.5
Blue Mountain Lake	.....	.....	.....	1.10	11.0
Bolivar	37	—15	14.8	1.56	16.5
Bouckville	33	— 8	13 8	3.30	34.0
Boyds Corners	.....	.....	.....	0.94	10.0
Brockport	36	— 1	17.2	3.35	30.0
Caldwell	40	— 9	16.3	0.58	5.9
Canaan Four Corners	37	— 4	15.0	0.85	8.5
Canajoharie	36	0	16.8	0.32	2.9
Canton	35	—15	11.8	1.30	13.0
Carmel	41	— 7	20.2	0.81	8.4
Carvers Falls	46	—25	12.2	0.65	8.0
Catskill	46	3	21.8	0.05	5.0
Cedarhill	45	— 5	19.8	0.49	4.0
Cooperstown	34	—10	14.2	1.12	13.6
Cortland	.....	.....	.....	1 44	8.8
Cutchogue	45	10	24.8	0.50	2.5
Dekalb Junction	.....	.....	.....	0.94	12.0
Easton	.....	.....	.....	1.22	13.0
Elba	33	— 3	16.0	3.10	31.0
Elmira	38	0	19.3	0.59	10.5
Franklinville	37	—17	13.4	1 62	16.3
Fulton	.....	.....	.....	1.80	18.7
Gabriels	28	—12	8.6	1.50	21.0
Glens Falls	39	— 5	17.2	0.41	6.0
Gloversville	32	— 5	13.0	1.09	11.0
Greenwich	36°	—16°	13.1°	0.49	4.8
Griffin Corners	37	— 7	15.2	0.54	8.1
Haskinville	.....	.....	.....	0.40	4.0
Hemlock	36	— 4	16.8	1.10	11.0
Honeymead Brook	41	— 3	18.6	0.63	6.3
Honnedaga Lake	.....	.....	.....	2.50	25.0
Humphrey	34	— 5	13.6	2.59	32.2
Indian Lake	32	—16	11.2	0.51	7.4
Ithaca	36	— 8	17.0	0.93	11.8
Jamestown	36	— 4	17.6	4.50	45.0
Keens Valley	36	— 6	14.8	0.73	9.1
King Ferry	.....	.....	.....	1.25	17.6
King Station	.....	.....	.....	0.60	6.0
Liberty	34	— 4	14.6	3.55	12.5
Littlefalls, City Res	34	— 4	13.6	0.78	11.5
Lockport	39	1	19.0	2.55	25.5
Lowville	31	—11	11.4	2.06	25.2
Lyndonville	.....	.....	.....	1.78	.....
Mayle	.....	.....	.....	2.80	33.0
Meredith	32	— 5	12.8	0.89	8.9
Middletown	41	6	21.4	1.80	14.0
Mohonk Lake	.....	.....	.....	0.95	10.5
Moira	33	— 7	12.4	2.30	23.0
Newark Valley	.....	.....	.....	0.93	7.0
New Lisbon	32	—18	12.8	0.83	11.0

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
New York—Cont'd.	°	°	°	*Ins.*	*Ins*
North Hammond	32	— 4	14.4	0.74	11.2
North Lake	34	—25	5.6	5.08	.....
Nunda	38	— 6	17.5	.....	.....
Ogdensburg	34	— 5	13.2	0.48	7.0
Old Chatham	.....	.....	.....	0.82	8.2
Oneonta	35	— 8	18.0	0.92	16 7
Oxford	36	—13	15.9	2.05	20.5
Palermo	32	— 9	15.4	3.04	29.6
Penn Yan	36	— 4	18.3	1.17	11.8
Perry City	40	—10	15.4	1.42	14.0
Plattsburg Barracks	35	— 6	12.6	1.22	13.0
Port Byron	35	— 3	17.2	3.92	38.0
Port Jervis	43	— 1	21.8	1.13	8.6
Primrose	46	0	24.4	1.02	10.0
Redhook	.....	.....	.....	0.77	13.6
Richmondville	35	— 7	14.3	0.66	8.0
Ridgeway	34	0	17.8	2.97	29.7
Rome	28	—10	11.0	1.30	17.0
Romulus	35	2	18.6	1.28	12.6
Salisbury Mills	.....	.....	.....	0.86	8.6
Saranac Lake	30	—14	10.0	0.94	10.4
Saratoga Springs	39	— 7	15.6	0.61	6.0
Schenectady	38	2	17.0	0.60	6.0
Setauket	43	10	25.3	0.69	9.7
Shortsville	34	— 2	16.7	1.31	13.0
Skaneateles	.....	.....	.....	3.35	.....
South Berlin	39	— 7	14.2	0.85	12.0
South Canisteo	33	—11	15.6	1.32	13.2
Southeast Reservoir	.....	.....	.....	0.79	6.0
Southampton	39	8	24.4	0.55	4.5
South Kortright	37	— 7	13.9	1.23	12.3
South Schroon	.....	.....	.....	0 38	5.0
Straits Corners	41	—13	16.4	2.12	21.2
Ticonderoga	38	— 9	15.4	0.59	9.0
Volusia	35	— 5	15.6	1.74	.....
Walton	35	—13	15.4	0.78	10.7
Wappingers Falls	46	—12	21.7	1.33	13.0
Warwick	.....	.....	.....	0 77	.....
Watertown	38	—10	13.8	2.07	35.2
Waverly	42	— 9	18.2	0.86	10.1
Wedgwood	34	— 4	15.4	1.37	15.6
Wells	37	—19	11.8	0.99	9.8
West Berne	35	— 2	15.1	1.40	14.0
West Chazy	36	—10	13.4	.....	.....
Westfield *a*	38	0	18.6	0.92	7.9
Westfield *b*	37	— 3	17.0	.....	.....
Westfield *c*	30	1	19.4	1.44	16.6
Windham	36	— 8	15.3	0.87	12.4
Wolcott	.....	.....	.....	2.45	24.5
North Carolina.					
Abshers	70	10	36 3	1.48	1.0
Asheville	.....	.....	.....	0.91	T.
Biltmore	61	9	34.8	1.40	0.2
Bryson City	.....	.....	.....	2 49	T.
Chapelhill	73	11	37.9	1.52	2.0
Cherryville	73	12	39.0	2.08	1.5
Currituck	.....	.....	.....	1 40	6.0
Durham	71	12	38.4	1.70	1.5
Edenton	68	14	38.6	2.18	7.0
Fayetteville	76	16	41.0	1.91	5.0
Flatrock	71	3	35.8	1.90	1.0
Goldsboro	72	11	37.1	1.79	.....
Greensboro	71	16	36.2	1.95	.....
Henderson	70	12	37.4	0.70	1.5
Hendersonville	69	8	36.0	1.76	0.5
Henrietta	74	11	40.4	2.31	1.0
Highlands	58	4	30.6	2.95	5.0
Kinston	74	12	39.5	2.49	8.0
Lenoir	65	11	37.0	1.70	
Linville	55	8	29.2	3.15	8.0
Littleton	71	16	36.3	1.02	3.0
Louisburg	69	13	37.0	0.68	4.0
Lumberton	69	14	39.8	2.18	7.0
Marion	74	12	38.6	2.06	1.7
Marshall	62[1]	9[1]	35.6[1]	0.89	T.
Mocksville	76	15	37.6	1.59	1.0
Moncure	70	8	40.4	1.49	2.3
Monroe	72	8	39.7	1.71	2.5
Morganton	68	12	38.6	2.80	
Mountairy	70	10	36.0	1.26	2.0
Murphy	.....	.....	.....	2.49	T.
Newbern	77	17	43.0	3.43	9.0
Oakridge	71	13	36.2	1.30	0.6
Patterson [1]	70	14	34.2	1.71	1.0
Pittsboro	74	7	39.6	1.90	3.0
Rockingham	72	7	39.4	1.68	3.0
Roxboro	68	12	37.0	1.08	1.9
Salem	71	10	36.8	2.12	0.5
Salisbury	75	18	39.8	1.77	T.
Saxon	72	10	37.6	1.17	1.0
Selma	73	10	37.6	1.97	6.0
Settle	72	14	39.2	1.39	0.1
Sloan	75	9	40.7	4.39	8.0
Soapstone Mount	70	9	36.0	1.58	1.5
Southern Pines *a*	76	10	42.0	1.81	2.0
Southern Pines *b*	73	13	40.4	1.70	4.0

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
North Carolina—Cont'd	°	°	°	*Ins.*	
Southport	68	17	43.8	4.18	7.4
Springhope [1]	62	13	35.9	1.60	4.0
Statesville	75	9	36.6	1.93	0.5
Tarboro	73	12	38.1	1.92	6.0
Washington	72	15	42.4	2.59	8.0
Waynesville	65	7	34.2	1.40	
Weldon *a*	67°	11°	38.0°	1.21	3.0
Weldon *b*	.....	.....	.....	1.20	3.0
North Dakota.					
Amenia	45	—21	8.2	0.20	2.0
Ashley	48	—21	7.2	0.40	4.0
Bottineau	43	—22	2.8	0.02	3.2
Buxton	.....	—22	.....	0.09	0 9
Churchs Ferry	40	—27	—0.9	0.40	4.0
Coalharbor	52	—19	8.7	0.15	1.5
Devils Lake	37	—28	2.7	0.10	1.0
Dickinson	55	—18	12.8	0.39	0.7
Donnybrook	.....	.....	.....	0.50	5.0
Dunseith	38	—25	3.6	0.28	2.8
Ellendale	55	—17	13.4	0.30	3.0
Falconer	54	—15	11.7	0.02	0.2
Fargo	44	—21	6 2	0.11	1.1
Forman	51	—16	10.8	0.50	5.0
Fort Berthold [4]	60	—17	13.0	0.25	2.5
Fort Yates	57	—13	12.0	0.88	8.8
Fullerton	55	—17	10.0	0.32	3.2
Gallatin	36	—28	3 7	0.30	3.0
Glenullin	55	—15	13.4	0 43	1.2
Grafton	39	—19	5.6	0.65	6.5
Hamilton	42	—17	5.4	0.32	3.2
Hannaford	37	—27	3.8	0.32	3.0
Jamestown	42	—25	6.0	0.65	6.5
Larimore	39	—23	2.6	0.30	3.0
McKinney	39	—28	2.8	0.25	2.5
Mayville	44	—20	7.4	0.35	3.5
Medora	58	—19	14.6	0.55	3.0
Melville	38	—18	6.8	T.	T.
Milton	32	—25	0.0	0.40	4.0
Minnewaukon	47	—26	2.7	0.18	1.8
Minto	40	—22	5.4	0.39	4.6
Napoleon	38	—22	6.0	0.35	3.0
New England	52	—17	12.7	.....	.....
Oakdale	51	—21	12.7	0.40	2.0
Pembina	37	—30	1.0	0.36	3.6
Portal	40	—31	5.9	0.40	4.0
Power	50	—19	10.6	0.30	2.0
Sheyenne	38	—25	5.0	0.30	2.0
Steele	40	—23	6.6	0.25	2.5
University	59	—18	6.9	0.30	2.0
Wahpeton	49	—18	9.7	0.42	4.2
Willow City	39	—26	2.4	T.	T.
Woodbridge	38	—27	0.0	0.17	1.7
Ohio.					
Akron	39	1	18.8	1.35	7.5
Annapolis	43	— 5	20.8	0.49	.....
Ashland	40	— 2	17.4	1.05	8.0
Ashtabula	35	— 5	18.5	1.90	18.0
Atwater	.....	.....	.....	1.10	3.0
Bangorville	40	— 6	19.0	1.32	5.8
Bellefontaine	40	2	19.0	.....	.....
Bement	.....	.....	.....	1.46	3 5
Benton Ridge	40	— 4	19.0	2.10	11.0
Bethany	58	4	25.4	1.58	2.2
Bigprairie	40	— 1	20.9	1 31	3.2
Binola	.....	.....	.....	1.80	16.0
Bladensburg	41	— 6	21.2	0.59	3.4
Bloomingburg	45	2	23.4	0.50	2.5
Bowling Green	36	—13	16.4	1.30	12.5
Bucyrus	38	— 4	16.9	1.90	4.0
Cambridge	45	— 8	23.3	0.61	T.
Camp Dennison	49	7	26.7	1.39	5.8
Canal Dover	41	— 5	21.0	1.58	4.0
Canton	41	2	21.6	1.64	10.3
Cardington	38	—10	20.0	0.99	2.2
Cedarville	.....	.....	.....	1.70	5.5
Celina	41	— 8	19.0	0 80	3.5
Circleville	45	4	23.6	0.78	6.2
Clarksville	47	2	24.6	1.10	4.5
Cleveland *a*	38	1	20.6	1.66	12.3
Cleveland *b*	36	0	18.4	1.17	7.5
Coalton	45	1	26.1	1.11	2.0
Colebrook	37	—11	16.8	0.60	6.0
Dayton *a*	.....	.....	.....	1.26	4.3
Dayton *b*	48	3	24.4	1.33	4.2
Defiance	36	—10	15.2	1.07	12.6
Delaware	40	— 6	21.4	1.21	4.5
Demos	40	— 2	22.2	0.95	6.0
Elyria	38	— 6	17.7	0.79	7.9
Findlay	40	— 2	19.4	1.45	7.2
Frankfort	45	3	24.4	1.15	4.0
Garrettsville	41	—15	16.9	1.95	15.6
Granville	47	0	22.2	0.74	4.3
Gratiot	40	— 3	21.4	0.74	4.6
Green	55	10	28.8	1.40	0.5
Greenhill	41	— 7	18.4	0.95	5.0

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Ohio—Cont'd.	°	°	°	*Ins.*	*Ins*
Greenville	41	2	22.4	1.25	3.0
Hanging Rock	54	10	29.0	0.80	T.
Hedges	41	0	18.4	1.03	.....
Hillhouse	40	— 9	16.6	2.06	.....
Hillsboro	46	3	23.4	0.91	4.0
Hiram	38	— 4	17.6	1.41	9.5
Jacksonboro	50	3	24.8	1.90	8.5
Killbuck	40	— 2	20.3	1.24	3.2
Lancaster	44	5	24.6	0.50	1.7
Leipsic	37	— 8	16.9	1.70	17.0
Lordstown	41	— 6	18.1	1.16	7.5
McConnelsville	44	2	25.2	1.17	3.8
Mansfield	.....	.....	.....	1.45	10.0
Marietta	47	7	27.9	0.86	2.5
Marion	39	0	21.0	0.46	2.1
Medina	37	— 9	17.7	0.98	4.0
Milfordton	39	— 7	17.8	1.16	6.5
Milligan	48	— 4	23.7	0.97	2.0
Millport	41	—11	19.4	0.84	4.0
Montpelier	34	—14	14.4	1.70	16.0
Moorfield	48	— 9	22.8	0.45	2.0
Napoleon	38	— 5	17.6	1.25	12 5
New Berlin	40	— 3	20.0	1.30	5.7
New Bremen	42	— 3	19.5	0.77	2.6
New Holland	44	3	24.8	1.43	2.5
New Paris	45	— 1	21.8	1.23	1.0
New Richmond	57	7	27.7	1.23	4.8
New Waterford	40	— 5	19.8	1.20	5.0
North Lewisburg	40	— 4	20.0	1.45	4.5
North Royalton	39	— 3	18.2	1.85	13.0
Norwalk	38	—10	18.7	1.86	8.0
Oberlin	40	— 7	19.0	1.57	8.1
Ohio State University	42	2	22.8	1.16	2.4
Orangeville	42	—20	16 2	1.20	16.5
Ottawa	40	— 5	19.0	1.26	7.0
Pataskala	42	— 5	21.4	0.96	3.7
Philo	.....	3	.....	0.72	2.2
Plattsburg	44	0	21.6	1.65	2.0
Pomeroy	49	8	27.6	1.01	4.0
Portsmouth *a*	.....	.....	.....	1.33	2.0
Portsmouth *b*	54	10	27.8	1.36	3.8
Pulse	.....	.....	.....	2.90	9.5
Richwood	42	— 9	20.2	0.70	2.5
Ripley	54	7	27.4	1.31	3.6
Rittman	44	— 1	21.0	1.38	2.0
Rockyridge	35	— 6	16.8	1.82	9.5
Rosewood	42	0	21.0	0.65	3.0
Shenandoah	39	— 4	18.8	1.11	3.8
Sidney	40	— 1	20.2	1.13	3.7
Sinking Spring	60	5	27.1	2.70	6.5
Somerset	42	3	23.6	0.68	3.5
Springboro	.....	.....	.....	0.87	.....
Springfield	.....	.....	.....	1.07	0.1
Strongsville	.....	.....	.....	1.60	6.0
Swanton	.....	.....	.....	1.44	2.5
Thurman	49	5	27.4	1.15	4.5
Tiffin	38	1	19.6	1.64	11.0
Urbana	42	1	21.6	0.99	3.5
Vanwert	40	— 3	17.6	1.46	5.0
Vermillion	35	0	17.2	1.21	6.8
Vickery	42	—11	18.4	1.34	9.5
Walnut	.....	.....	.....	0.60	1.7
Warren	41	— 1	19.4	1.60	10.4
Warsaw	43	— 7	21.1	1.06	1.0
Wauseon	37	—11	16.6	1.38	16.2
Waverly	47	7	27.0	1.46	4.8
Waynesville	47	2	23.8	1 34	6.0
Wellington	39	0	20.4	1.85	8.5
Westerville	42	— 2	22.8	1.31	4.7
Willoughby	.....	.....	.....	1.50	15.0
Wooster	40	0	20.0	1.20	2.8
Zanesville	.....	.....	.....	0.82	3.0
Oklahoma.					
Arapaho	68	10	36.8	0.53	1.5
Beaver	71	5	35.8	0.05	0.5
Blackburn	68	8	33.8	0.92	4.8
Burnett	71	14	38.4	0.80	0.4
Clifton	72	13	37.8	1.13	0.7
Fort Reno	69	12	36.2	0.57	1.5
Fort Sill	70	6	40.2	1.00	5.0
Hennessey	70	10	35.3	1.23	2.0
Jefferson	74	9	33.4	0.63	0.5
Jenkins	70	7	35.2	0.39	0.5
Kenton	72	— 1	33.9	0.30	3.0
Kingfisher	68	13	37.2	1.01	3.5
Mangum	68	13	37.9	0.90	5.0
Newkirk	65	10	34.2	1.40	T.
Norman	73	11	36.7	1.53	1.0
Pawhuska	68	10	36.4	0.87	0.7
Perry	68	11	36.4	0.76	0.8
Prudence	71	6	32.6	0.77	1.9
Sac and Fox Agency	70	12	36.4	1.40	2.5
Stillwater	68	13	37.1	0.59	1.4
Taloga	68	10	36.6	0.27	0.2
Texmo	72	12	41.8	0.40	4.0
Vittum	71	12	36.9	0.91	3.7
Oklahoma—Cont'd.					
Waukomis	72	12	37.0	0.79	0.5
Woodward	74	8	37.6	T.	T
Oregon.					
Albany *a* [*1]	67	28	44.5	4.33	
Albany *b*	.....	.....	.....	5.89	
Alpha	70	18	43.0	14.74	0.2
Arlington	68	15	39.2	2.79	T.
Ashland *b*	63	18	41.4	2.85	4.0
Aurora [*1]	67	25	44.8	4.89	
Aurora (near)	68	33	41.7	5.68	
Bandon	63	27	46.6	6.91	
Bay City	64	24	43.2	13.27	0.5
Beulah	62	— 1	33.1	1.94	9.5
Blalock	69	23	.....	2.15	T.
Brownsville [*1]	70	26	43.0	3.06	1.0
Bullrun	57	23	39.0	11.63	0.5
Burns	53	— 9	27.8	1.67	13.0
Cascade Locks	62	27	42.2	15.20	0.5
Comstock [*1]	72	18	43.9	5.99	
Coquille	.....	.....	.....	6.34	
Corvallis	68	21	42.4	6.28	
Dayville	65	10	38.0	1.33	0.3
Ella	.....	.....	.....	2.15	
Eugene	72	21	42.5	5.54	
Fairview	62	22	45.6	7.39	
Falls City	65	22	40.6	11.19	0.5
Forest Grove	68°	21°	40.2°	7.99	
Gardiner	63	28	45.6	11.17	
Glenora	60	30	40.6	14.22	4.5
Government Camp	58	12	33.1	8.40	15.0
Grants Pass	66	18	43.6	5.64	0.5
Hare	65	28	44.2	11.85	T.
Harris	70	19	41.6	9.00	4.0
Heppner	69	12	35.7	2.49	4.1
Hood River (near)	69	14	38.2	7.81	12.5
Huntington	54	12	35.4	3.02	7.0
Jacksonville	63	17	41.0	4.86	1.8
Joseph	53	1	26.0	0.80	3.5
Junction City [*1]	72	22	42.4	5.90	
Kerby	.....	16	.....	12.26	1.0
Lafayette [*1]	62	24	42.7	6.86	
Lagrande	56	9	33.4	3.37	2.7
Lakeview	60	— 1	32.2	2.58	11.4
McMinnville	67	24	42.3	7.07	
Merlin [*1]	70	18	44.8	6.29	1.0
Mount Angel	68	23	41.4	6.65	
Nehalem	.....	.....	.....	15.81	1.0
Newberg	68	24	42.8	6.69	T.
Newbridge	59	5	32.6	1.62	1.5
Newport	61	29	45.0	8.78	
Pendleton	71	9	37.2	2.67	6.3
Placer	.....	.....	.....	6.05	6.0
Prineville	60	— 8	28.6	2.09	5.0
Riddles [*1]	70	19	41.2	3.72	
Riverside	61	— 8	31.2	2.12	11.5
Salem *b*	.....	.....	.....	5.13	
Sheridan [*1]	62	21	39.6	5.17	
Silverlake	57	—20	30.7	1.69	4.0
Silverton [*1]	74	26	43.2	6.08	
Sparta	47	7	28.6	2.50	15.0
Springfield [*1]	71	21	42.4	5.73	
Stafford	66	23	41.2	7.11	
The Dalles	69	17	37.6	4.15	10.5
Toledo	65	22	41.5	5.44	
Umatilla	.....	.....	.....	1.85	2.0
Westfork [*1]	70	19	41.9	6.63	0.5
Weston	68	11	35.4	3.40	5.7
Williams	67	16	42.8	5.81	T.
Pennsylvania.					
Aleppo	47	— 2	23.8	0.60	5.0
Altoona	46	— 3	20.4	0.78	.....
Athens	41	— 8	18.3	0.45	4.2
Beaver Dam	.....	.....	.....	0.82	.....
Bellefonte	43	0	22.4	0.95	9.5
Brookville	.....	.....	.....	0.74	7.4
Browers Lock	.....	.....	.....	0.95	.....
Butler	44	—10	19.2	1.90	13.6
Carlisle	44	8	25.5	0.82	4.0
Cassandra	43	0	18.8	2.75	28.0
Chambersburg	44	— 7	22.8	0.27	2.7
Coatesville	47	5	26.5	1.03	4.8
Confluence	49	—11	22.7	1.25	8.8
Davis Island Dam	.....	.....	.....	0.75	4.9
Derry Station	44	— 1	20.9	1.73	10.0
Drifton	40	2	20.8	0.55	5.5
Driftwood	.....	.....	.....	0.45	7.0
Duncannon	.....	.....	.....	0.21	2.8
Dushore	42	—10	16.6	0.78	7.8
Dyberry	40	—10	16.4	0.91	9.7
East Bloomsburg	.....	.....	.....	0.06	0.9
East Mauch Chunk	45	1	22.5	0.89	8.2
Easton	48	8	23.7	0.71	6 5
Ellwood Junction	.....	.....	.....	0.85	3.5
Emporium	38	—17	17.9	1.08	11.0
Ephrata	44	7	24.6	0.77	5.1
Franklin	44	—18	17.4	1.12	6.0
Pennsylvania—Cont'd.					
Freeport	.....	.....	.....	0.97	4.2
Girardville	.....	.....	.....	1.03	10.5
Grampian	36	—16	17.6	1.98	9.0
Greensboro	57	5	26.9	0.43	2 8
Hamburg	.....	.....	.....	1.03	7.2
Hamilton	36	— 4	16.7	1.17	12.0
Hawthorn	41	—15	20.1	1.26	12.6
Herrs Island Dam	.....	.....	.....	0.74	.....
Huntingdon *a*	46	5	24.6	0 45	4.5
Huntingdon *b*	.....	.....	.....	0.67	5.3
Irwin	46	5	22.4	0.60	4.0
Johnstown	47	3	23.1	1.92	15.1
Karthaus	.....	.....	.....	0.50	8.0
Keating	.....	.....	.....	0.72	6.5
Kennett Square	47	7	26.4	1.01	2.6
Lancaster	49	6	26.8	1.14	3.8
Lawrenceville	38	—14	15.8	0.90	9.0
Lebanon	43	3	24.6	0.84	5.0
Leroy	37	— 4	16.5	0.75	7.5
Lewisburg	40	— 4	21.4	0.74	7.2
Lockhaven *a*	40	2	22.8	1.16	11.6
Lockhaven *b*	.....	.....	.....	0.80	.....
Lock No. 4	.....	.....	.....	0.47	5.2
Lycippus	47	— 1	20.0	1.15	8.8
Mifflin	.....	.....	.....	0.80	3.0
Oil City	.....	.....	.....	1.76	16.7
Parker	.....	.....	.....	1.02	8.5
Philadelphia	46	13	28.0	1.00	2.7
Pottstown	42	12	26.2	0.50	5.0
Quakertown	44	5	23.4	0.90	8.5
Reading [2]	.....	.....	24.2	0.67	
Renovo *a*	.....	.....	.....	0.85	9.0
Renovo *b*	40	— 4	21.2	0.91	8.9
Saegerstown	40	—22	16.1	1.74	12.4
St. Marys	39	— 8	16.8	1.43	14.3
Selinsgrove	40	0	23.1	0.80	8.0
Sinnamahoning	.....	.....	.....	0.88	5.5
Smethport	38	—14	16.3	0.60	6.0
Somerset	40	— 6	19.0	2.58	25.8
South Eaton	42	0	21.2	0.81	8.0
State College	44	0	20.0	0.73	7.4
Sunbury	.....	.....	.....	0.60	6.0
Swarthmore	41	8	23.8	0.60	3.0
Towanda	39	— 6	18.2	0.45	4.5
Troutrun	.....	.....	.....	0.85	8.5
Uniontown	47	4	25.0	0.67	6.0
Warren	38	—11	16.6	1.18	11.8
Wellsboro	38	— 7	19.6	0.80	8.0
Westchester	44	9	25.2	0.88	3.8
West Newton	.....	.....	.....	0.78	6.0
Westtown	43	6	24.4	0.76	3.1
Wilkesbarre	45	4	22.5	0.75	7.5
Williamsport	39	2	22.0	0.66	6.6
York	46	4	24.9	0.53	2.0
Rhode Island.					
Bristol	39	12	24.8	0.55	6.5
Kingston	42	5	21.8	1.13	8.0
Pawtucket	47	15	27.4	1.21	10.0
Providence *a*	45	10	24.4	1.00	10.0
Providence *c*	44	8	22.4	1.01	7.0
South Carolina.					
Beaufort	73	25	49.2	4.52	1.0
Blackville	77	15	44.8	3.42	6.6
Calhoun Falls	.....	.....	.....	3.31	4.0
Camden	.....	.....	.....	2.52	5.7
Cheraw *a*	76	12	41.6	1.91	4.5
Cheraw *b*	.....	.....	.....	1.95	4.7
Clemson College	72	16	40.8	3.77	2.5
Conway	.....	.....	.....	4.08	9.0
Darlington	.....	.....	.....	2.07	5.0
Edisto	.....	.....	.....	2.39	8.5
Effingham	.....	.....	.....	3.50	8.0
Florence	72	18	42.0	2.62	5.2
Gaffney	.....	.....	.....	2.72	0.5
Georgetown	65	22	44.8	5.40	5.0
Gillisonville	78	19	46.7	4.08	0.5
Greenwood	71	13	40.4	3.84	3.0
Holland	.....	.....	.....	3.52	2.5
Kingstree *a*	75	19	43.8	2.63	7.9
Kingstree *b*	.....	.....	.....	2.53	7.5
Liberty	69	16	40.2	3.34	4.0
Little Mountain	76	16	43.4	3.38	5.0
Longshore	72	13	42.2	3.53	3.0
McCall	76	10	43.2	1.42	4.0
Pinopolis [*1]	72	20	44.6	4.14	7.0
St. Georges	74	16	43.6	1.78	6.5
St. Matthews	72	21	44.7	2.88	6.9
St. Stephens	.....	.....	.....	3.66	11.5
Santuck	75	13	42.0	3.17	2.3
Shaws Fork	72	19	46.7	2.58	3.0
Smiths Mills	.....	.....	.....	2.81	3.6
Societyhill	72	17	41.8	1.95	6.0
Spartanburg	71	16	40.0	2.80	2.0
Statesburg	75	20	44.6	2.82	6.5
Summerville	77	20	45.3	3.41	4.5
Temperance	76	7	42.3	2.42	6.1

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
South Carolina—Cont'd.	°	°	°	*Ins.*	*Ins.*
Trenton	70	16	45.4	3.47	5.5
Trial	72	12	42.2	3.96	8.0
Walhalla	73	11	41.0	2.95	3.0
Winnsboro	73	18	43.0	1.28	3.0
Winthrop College	73	15	40.8	2.19	1.0
Yemassee	75	20	45.8	2.58	4.7
Yorkville	76	20	44.0	2.40	2.5
South Dakota.					
Aberdeen	60	−12	12.2	0.20	2.0
Academy	59	−15	19.2	0.24	2.3
Alexandria	56	−11	17.5	0.40	1.5
Ashcroft	65	−21	18.2	0.30	3.0
Badnation	63	−20	19.9	0.37	4.0
Bowdle	55	−16	11.3	T.	T.
Brookings	52	− 9	13.8	0.28	2.8
Canton	48	−15	18.0	T.	T.
Centerville	.....	.....	.....	0.67	5.8
Chamberlain	64	−13	19.3	0.27	2.0
Clark	55	−12	13.8	0.20	2.0
Desmet	50	−11	15.6	0.70	7.0
Doland	52	−20	13.9	0.35	1.8
Elkpoint	47	−18	19.6	0.45	8.5
Farmingdale	.....	.....	.....	0.33	4.2
Faulkton	56	−12	15.2	0.21	2.2
Flandreau	49	−12	13.9	0.49	2.5
Forestburg	47	−18	13.6	0.31	3.1
Fort Meade	52	−12	19.0	0.99	7.1
Fort Randall	60	−11	20.1	0.50	5.0
Gannvalley	58	−13	15.0	0.25	2.5
Gary	55	−11	15.0	0.30	3.0
Grand River School	60	−13	15.7	0.18	5.0
Greenwood	58	−10	21.6	0.49	4.9
Hartman	53	−12	16.2	0.34	1.0
Highmore	65	−14	14.0	0.05	0.5
Hotch City	61	−19	18.0	0.16	4.0
Howard	56	−10	17.4	0.18	1.8
Interior	60	−30	18.0	0.95	9.5
Ipswich	57	−16	12.6	T.	T.
Kimball	56	−11	18.2	0.21	0.9
Leola	55	−18	11.7	0.20	2.5
Leslie	50[1]	−24	16.6	0.08	.....
Mellette	56	−11	16.0	0.15	1.5
Menno	50	−17	17.1	0.15	2.1
Millbank	58	−14	12.2	0.30	3.0
Mitchell	56	−10	19.0	0.20	2.0
Mound City	55	−16	13.3	0.27	2.7
Oelrichs	56	−20	17.5	1.40	14.0
Parker	53	−13	18.0	0.09	2.0
Pine Ridge	53	−25	16.6	0.42	7.4
Plankinton	56	−12	16.6	0.10	1.0
Redfield	57	−14	16.2	0.18	1.0
Rochford	59	−25	18.7	0.61	6.1
Rosebud	71	−19	18.7	1.10	11.0
St. Lawrence	58	−10	19.1	0.10	T.
Silver City	.....	.....	.....	0.60	5.5
Sioux Falls	.....	.....	.....	0.10	1.0
Sisseton Agency	50	−14	11.9	0.27	2.7
Spearfish	54	− 9	20.4	0.76	8.0
Tyndall	51	− 9	19.2	0.49	5.0
Vermillion	48	−12	20.0	0.37	8.0
Watertown	48	−13	12.1	0.25	2.5
Waubay	50	−15	9.3	0.43	3.5
Wentworth	52	− 9	15.2	0.23	2.3
Wessington Springs	.....	−15	.....	0.52	2.0
Wolsey	.....	.....	.....	0.25	1.5
Tennessee.					
Andersonville	62	13	32.8	1.12	T.
Ashwood	69	17	37.5	1.99	0.8
Benton	70	18	38.3	1.56	0.1
Bluff City	.....	.....	.....	1.10	1.0
Bolivar	71	19	37.8	2.02	T.
Bristol	63	10	31.0	1.61	T.
Byrdstown	63	13	34.3	2.07	5.5
Carthage	64	17	34.6	1.75	1.9
Charleston	.....	.....	.....	1.77	T.
Clarksville	68	14	36.4	2.28	3.0
Clinton	.....	.....	.....	1.45	1.0
Decatur	72	17	38.0	1.87	T.
Dickson	70	13	36.0	1.21	0.2
Dover	68	14	34.4	2.36	1.0
Elizabethton	65	10	32.7	1.19	0.8
Erasmus	66	7	33.0	1.76	1.5
Florence	65	17	36.6	1.13	1.0
Franklin	68	16	36.6	1.21	0.5
Grace[*1]	60	18	35.6	2.00	2.0
Greeneville	65	9	33.7	1.22	2.0
Harriman	70	15	36.2	1.34	T.
Hohenwald	68	11	36.6	2.21	1.5
Iron City	70	14	38.5	3.10	.....
Jackson	68	18	40.4	1.75	
Johnsonville	73	13	36.4	1.86	1.5
Jonesboro[*1]	60	9	32.5	1.72	0.8
Kingston	.....	.....	.....	1.11	T.
Lafayette[*6]	58	14	32.6	2.09	3.0
Lewisburg	60	16	37.2	1.94	0.5
Lynnville	67	18	38.6	2.18	0.5
Tennessee—Cont'd.	°	°	°	*Ins.*	*Ins.*
McKenzie	70	12	37.6	2.83	1.0
McMinnville	68	17	37.5	2.02	2.0
Maryville	72	15	38.0	1.42	0.5
Newport	68	14	36.2	1.08	1.0
Nunnelly	72	13	37.3	1.65	1.0
Oakhill	66	13	35.0	2.12	8.0
Palmetto	68	17	37.8	1.67	0.5
Peryear[*5]	60	10	35.6	2.22	T.
Pope	71	14	36.8	2.22	1.0
Rogersville	64	18	34.0	1.41	1.6
Rugby	64	8	31.8	2.50	1.5
Savannah	70	19	39.8	1.85	T.
Sewanee	68	11	35.0	1.52	T.
Silverlake	58	5	29.2	1.61	.....
Springdale	75	10	34.6	1.25	1.1
Springfield	67	13	35.6	2.05	3.0
Tazewell	.....	.....	.....	1.11	2.6
Tellico Plains	72	16	39.1	0.85	T.
Tracy City	68	13	35.0	1.68	1.1
Tullahoma	67	12	36.3	2.10	0.5
Union City	65	14	36.4	1.87	T.
Waynesboro	69	14	37.3	1.21	0.1
Wildersville	68	18	39.0	2.32	1.2
Yukon	68	16	38.0	2.10	
Texas.					
Alvin	.....	.....	.....	2.26	
Anna	79	10	44.8	2.38	0.1
Arthur	.....	.....	.....	1.83	4.2
Austin *a*	80	20	49.4	1.80	
Austin *b*[*5]	76	19	46.7	.....	
Ballinger	77	12	41.8	1.01	1.0
Bastrop	.....	.....	.....	0.82	
Beaumont	73	31	52.9	3.41	
Bigspring	.....	.....	.....	1.93	6.0
Blanco	84	20	44.2	0.89	
Boerne[*1]	78	22	48.3	1.08	
Booth	.....	.....	.....	1.81	
Bowie	75	9	42.8	1.54	1.5
Brazoria	80	26	53.8	2.13	
Brenham	81	25	50.4	1.64	
Brighton	75	28	56.0	1.95	
Brownwood	75	16	47.8	2.15	3.5
Burnet[*1]	78	20	48.7	1.12	
Camp Eagle Pass	89	23	52.4	0.80	
Coleman	86	16	45.5	2.01	6.0
College Station	83	22	49.0	3.20	
Colorado	77[e]	15[e]	43.4[e]	1.63	3.0
Columbia	78	23	52.1	2.23	
Corsicana	78	17	45.6	2.63	1.0
Cuero	82	26	52.0	1.89	
Dallas	79	15	43.9	2.28	3.5
Danevang	79	26	54.0	3.08	
Dublin	77	.....	.....	1.00	T.
Duval	80	23	49.5	1.36	
Estelle	81	14	45.0	2.21	4.0
Fort Brown	87	25	56.6	0.00	
Fort Ringgold	92	31	62.0	0.84	
Fort Stockton	.....	.....	.....	0.70	
Fredericksburg[*1]	79[b]	21[e]	50.0[d]	1.13	
Gainesville	76[f]	11[e]	41.2[d]	2.05	3.2
Greenville	78	11	44.0	2.49	2.5
Hale Center	74	3	40.0	0.96	9.5
Hallettsville	80	25	52.4	1.27	
Haskell	79	12	40.4	1.40	7.5
Henrietta	72	7	45.2	1.54	5.9
Hewitt	.....	.....	.....	2.05	1.0
Hondo	.....	.....	.....	0.63	
Houston	76	26	51.3	2.08	
Huntsville	76	24	48.5	3.96	
Ira	85	7	41.8	1.69	9.5
Jacksonville	77	19	48.1	3.68	1.2
Jasper	77	27	54.1	4.27	2.0
Kaufman	79	13	46.9	.....	.....
Kent	.....	.....	.....	1.72	T.
Kerrville	85	19	45.6	1.13	
Kopperl	.....	.....	.....	1.90	1.0
Lampasas	85	19	46.8	1.69	0.5
Laureles Ranch	.....	.....	.....	1.64	
Llano[*5]	80	30	48.8	0.60	
Longview	78	20	45.7	4.01	
Luling	82	22	50.2	0.88	
Mann	75[e]	16[e]	44.2[e]	4.25	.....
Menardville	82	18	44.8	0.90	
Mount Blanco	.....	0	.....	1.00	10.0
Nacogdoches	80	22	48.3	5.14	1.5
New Braunfels	83	24	51.2	0.69	
Port Lavaca	78	31	54.6	1.25	
Rhineland	74	14	41.2	0.93	6.5
Rockisland	81	26	53.2	1.62	
Rockport[*1]	74	39	53.2	.....	
Runge	84	25	52.5	1.05	
Sabine	.....	.....	.....	1.81	
Saginaw[*1]	72	14	44.9	2.17	1.2
Sanderson	75	28	52.7	0.00	
San Saba	82	18	48.6	1.45	
Sherman	74	18	44.4	1.06	1.3
Texas—Cont'd	°	°	°	*Ins.*	*Ins.*
Sugarland	82	26	55.0	1.06	
Temple *a*	80	18	47.0	2.49	1.0
Temple *b*	78	18	46.4	2.05	1.0
Trinity	78	23	51.3	6.06	1.5
Valentine	92	22	52.5	2.15	
Victoria	.....	.....	.....	1.52	
Waco	78	19	47.3	3.10	1.0
Waxahachie	80	15	45.8	2.15	0.1
Weatherford	77	15	43.3	2.56	2.0
Wichita Falls	.....	.....	.....	1.50	5.5
Utah.					
Alpine	.....	.....	.....	2.94	14.0
Blackrock	60	−11	32.5	1.43	12.4
Bluecreek[*1]	52	7	29.9	2.07	13.0
Castledale	61	−22	24.0	1.46	.....
Corinne	53	6	32.0	2.20	8.0
Deseret	64	2	34.7	1.67	12.0
Emery	63	− 5	30.0	.....	.....
Farmington	52	10	31.6	3.31	≥1.4
Fillmore	66	4	36.2	2.00	.....
Fort Duchesne	60	−21	22.0	0.95	9.5
Frisco	57	4	32.8	2.36	20.5
Giles	68	8	37.0	0.33	1.5
Government Creek	55	4	32.2	1.42	11.1
Green River	70	1	32.9	1.33	12.9
Grover	61	2	32.7	0.67	6.0
Heber	54	−12	27.6	2.20	14.5
Henefer	60	−23	23.4	2.65	22.0
Hite	70	24	45.0	.....	9.0
Holyoake	70	19	40.8	0.86	0.2
Huntsville	.....	.....	.....	2.52	12.5
Kelton[*1]	55	5	28.9	1.00	10.0
Lasal	54	9	31.6	.....	.....
Levan	58	2	33.0	2.23	5.0
Loa	56	−23	23.6	0.50	4.0
Logan	51	1	28.3	1.55	.....
Lund	58	−26	28.6	1.73	17.5
Manti	60	−10	30.6	2.50	16.0
Marysvale	.....	.....	.....	1.29	15.8
Meadowville	49	−21	21.6	1.90	11.5
Millville	.....	.....	.....	1.12	.....
Minersville	59	− 3	33.0	2.21	19.4
Moab	68	17	40.4	0.58	2.0
Mount Pleasant	60	4	32.4	2.16	11.0
Ogden[*1]	54	9	33.6	2.63	14.2
Park City	50	0	27.2	2.35	30.0
Parowan	59	− 4	32.0	1.84	11.3
Pinto	56	−12	30.7	2.74	31.5
Promontory[*1]	48	3	26.8	.....	.....
Provo	62	8	35.4	2.06	2.8
Richfield	62	1	27.4	.....	.....
St. George	75	16	42.3	2.72	4.5
Scipio	61	−11	32.8	2.43	10.5
Smithville	55	.....	.....	0.90	9.0
Snowville	51	4	29.8	1.04	10.0
Soldier Summit	46	− 5	26.6	3.60	36.0
Terrace[*1]	49	4	24.1	.....	.....
Thistle	63	3	34.2	2.35	10.0
Tooele	56	12	32.8	0.92	.....
Tropic	54	−12	27.2	4.80	48.0
Vernal	60	−10	26.1	1.36	12.5
Wellington	58	−21	25.8	1.10	11.0
Vermont.					
Bennington	40	− 9	15.1	0.45	5.5
Burlington	35	2	16.7	0.67	7.0
Chelsea	37	− 9	10.0	0.42	8.0
Cornwall	36	− 6	14.6	0.92	10.0
Derby	30	−19	7.6	2.27	22.7
Enosburg Falls	37	−20	8.1	3.65	36.5
Hartland	39	−16	13.7	0.45	5.2
Jacksonville	37	− 9	13.8	0.70	10.0
Manchester	35	− 3	14.4	0.56	9.5
Norwich	39	−14	13.4	0.25	2.5
St. Johnsbury	36	−21	11.0	0.56	7.5
Vernon[*6]	44	−10	16.9	0.54	6.0
Wells	34	−10	13.1	0.94	14.0
Woodstock	36	−10	17.4	0.35	6.0
Virginia.					
Alexandria	56	14	31.2	0.53	0.1
Ashland	63	14	34.2	0.36	0.5
Barboursville	.....	13	.....	0.42	0.1
Bigstone Gap	69	10	33.6	1.39	2.0
Birdsnest	.....	.....	.....	0.85	3.5
Blacksburg	62	7	29.4	0.74	0.5
Bon Air	61	13	32.7	0.69	1.2
Buckingham	69	11	32.8	0.59	T.
Burkes Garden	55	4	26.4	0.81	4.0
Callaville	64	9	34.2	2.51	3.0
Charlottesville	63	13	33.2	0.90	T.
Christiansburg	.....	.....	.....	0.63	T.
Cliftonforge	.....	.....	.....	0.35	
Columbia	67	10	33.8	0.35	T.
Dale Enterprise	64	5	28.6	0.28	2.0
Farmville	67	14	35.2	1.45	T.
Fontella	69	9	35.2	0.98	.....
Fredericksburg	58	14	32.3	0.50	T.

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Virginia—Cont'd.	°	°	°	*Ins.*	*Ins.*
Grahams Forge	58	8	30.0	0.94	1.8
Hampton	56	15	36.4	0.88	3.8
Hot Springs	56	8	26.6	0.23	1.0
Lexington	63	1	30.4	0.57	.....
Lincoln	55	8	28.2	0.27	T.
Manassas	58	9	30.4	0.38	T.
Marion	65	6	31.9	1.57	5.0
Meadowdale	50	3	23.9	0.92	5.5
Newport News	54[3]	13[3]	35.6[4]	0.85	4.5
Petersburg	66	9	34.6	0.70	1.6
Radford	.....	.....	.....	0.50	2.0
Rockymount	.....	.....	.....	1.45	T
Salem	.....	.....	.....	0.76	.....
Speers Ferry	.....	.....	.....	1.69	1.1
Spottsville	62	9	34.6	0.80	3.4
Stanardsville	61	8	30.6	T.	T.
Staunton	62	13	32.4	0.32	1.0
Stephens City	57	10	29.1	0.33	1.0
Warsaw	57	12	31.0	1.00	1.0
Westpoint	50	9	31.3	0.20	2.0
Williamsburg	58	13	34.8	0.45	1.5
Woodstock	52	12	26.4	0.15	0.5
Wytheville	63	11	32.2	0.99	2.5
Washington.					
Aberdeen	55	15	37.9	11.10	3.5
Anacortes	.....	.....	.....	2.54	
Ashford	.....	.....	.....	6.71	5.8
Bremerton	62	25	41.6	6.26	1.0
Brinnon	61	26	41.4	7.74	0.3
Cedonia	47	7	27.4	1.87	9.8
Centerville	59	15	33.1	4.46	5.0
Chehalis	60	19	40.1	3.05	10.0
Clearwater	53	27	38.6	14.58	
Cle Elum	62	6	31.4	4.06	5.0
Colville	49	3	29.1	1.23	4.4
Conconully	49	— 3	25.7	1.10	11.4
Connell	.....	.....	.....	1.26	2.5
Coupeville	51	26	41.4	1.14	
Crescent	53	5	29.8	2.48	8.0
Dayton	60	10	32.7	2.61	0.3
Ellensburg	66	6	31.4	1.74	7.2
Ellensburg (near)	64	8	32.2	2.30	8.5
Grandmound	63	19	40.2	5.78	4.4
Granite Falls	.....	.....	.....	4.40	1.0
Hooper	65	11	36.2	1.59	T.
Issaquah	.....	.....	.....	5.72	
Lacenter	65	21	41.5	7.07	1.0
Lakeside	60	11	30.8	2.15	11.0
Lind	60	10	32.3	2.54	4.3
Loomis	59	8	33.4	.....	.....
Mayfield	58	17	35.7	6.98	2.2
Monte Cristo	49	14	32.5	16.09	30.2
Mottinger Ranch	59	17	38.2	1.65	T.
Mount Pleasant	66	28	40.8	9.00	T.
Moxee Valley	71	8	33.9	1.59	4.9
New Whatcom	62	24	42.5	3.18	4.0
Northport	52	— 9	26.6	1.52	4.0
Olga	63	28	40.9	3.38	T.
Olympia	63	22	41.4	7.16	0.5
Pasco	67	11	36.6	1.39	.....
Pinehill	67	13	36.9	7.31	20.4
Port Townsend	64	30	42.5	0.94	
Republic	52	— 7	26.8	1.71	7.5
Rosalia	58	13	33.4	3.06	2.0
Sedro	68	18	40.6	3.33	
Silvana	62	20	40.4	2.89	
Snohomish	63	19	39.6	3.52	T.
Snoqualmie	.....	.....	.....	7.29	
Southbend	56	20	40.5	9.76	
Sprague	.....	.....	.....	3.90	
Sunnyside	70	8	33.6	1.46	3.5
Twin	64	24	39.4	6.91	1.0
Union	62	21	40.8	12.03	T.
Usk	44	0	25.6	....	9.5
Vancouver	69	18	41.4	6.70	
Vashon	64	25	41.0	6.09	
Waterville	52	2	24.0	1.52	11.5
Wenatchee (near)	64	7	30.0	2.81	19.9
West sound	60	22	39.8	3.51	1.5
Wilbur	44	2	28.0	1.83	5.3
West Virginia.					
Beckley	52	5	24.2	0.32	1.0
Beverly	52	2	25.6	1.50	10.0
Bluefield	57	7	29.1	1.03	4 5
Buckhannon	54	4	24.4	1.34	9.0
Burlington	56	6	27.0	0.25	1.0
Byrne	53	5	27.8	0.48	4.0
Camden	51	7	29.4	1.64	.....
Central	53	2	25.6	0.61	3.0
Chapel	52	9	27.7	2.39	13.8
Charleston	.....	.....	.....	0.32	1.8
Creston	52	4	27.8	0.94	4.0
Dayton	50	2	25.6	0.62	2.4
Elkhorn	59	10	31.4	1.16	6.5
Fairmont	.....	.....	.....	0.67	2.5
Glenville	51	6	26.2	1.36	6.8
Grafton	51	4	23.4	0.73	4.2
Green Sulphur	62	5	26.4	0.62	1.0
Harpers Ferry	.....	.....	.....	0.51	2.5
Hinton *a*	.....	.....	.....	0.78	2.2
Hinton *b*	61	10	30.4	0.78	2.0
Huntington	47	11	25.6	1.25	0.3
Josiah	49	— 4	25.0	1.13	7.5
Lewisburg	58	— 6	26.6	0.85	1.0
Magnolia	62	8	29.0	0.10	1.0
Marlinton	53	— 2	25.6	0.97	1.5
Martinsburg	56	10	26.6	0.25	T.
Morgantown	50	6	24.6	0.55	3.0
New Martinsville	49	1	27 4	0.47	1.0
Nuttallburg	59	5	27.4	0.20	2.0
Oceana	58°	6°	28.7°	0.17	.....
Oldfields	67	12	31.6	0.37	1.7
Parsons	52	0	23.0	1.10	9.0
Philippi *a*	53	1	23.9	0.82	8.1
Point Pleasant	53	9	29.6	1.33	2.0
Powellton	59	10	30.8	1.09	5.6
Princeton	56	6	30.6	1.85	9.5
Romney	58	6	29.1	0.11	T.
Rowlesburg	.....	.....	.....	1.54	11.0
Southside	56	12	30.6	1.16	2.2
Spencer	55	2	28.6	1.66	9.2
Terra Alta	48	0	19.1	1.05	10.5
Uppertract	58	8	28.7	0.33	.....
Wellsburg	44	0	21.4	0.81	4.0
Weston *a*	.....	.....	.....	1.11	4.5
Weston *b*	56	4	27.8	0.75	7.5
Wheeling *a*	.....	.....	.....	0.82	4 0
Wheeling *b*	51	8	28.0	0.70	1.8
Williamson	60	14	33.8	1.30	2.0
Winfield	52	10	29.4	0.95	T.
Wisconsin.					
Amherst	33	—12	10.6	0.90	9.0
Antigo	.....	—12	.....	0.35	3.5
Ashland	.....	.....	.....	0.39	3.9
Barron	32	—22	5.4	0.50	5.0
Bayfield	34	— 8	10.6	0.60	6.0
Beloit	34	—10	13.8	1.69	16.9
Brodhead	36	—17	12.0	1.30	13.0
Butternut	41	—20	9.7	0.50	2.0
Citypoint	35	—10	11.4	0.54	8.5
Delavan	.....	—10	.....	0.65	12.0
Dodgeville	34	—12	11.8	0.85	14.0
Easton	34	—15	10.6	0.92	10.2
Eau Claire	33	—12	10.8	0.63	6.5
Florence	37	—12	9.7	0.40	4.0
Fond du Lac	36	— 8	14.0	0.42	6.3
Grand River Locks	.....	.....	.....	0.64	10.0
Grantsburg	35[4]	—24	9.9	0.65	6.5
Hartford	36[7]	—10	14.0°	1.17	11.5
Hartland	34	— 8	11.8	1.36	14.0
Harvey	38	—11	13.0	0.88	7.6
Hayward	41	—26	9.2	0.48	4.8
Heafford	34	—24	6.5	0.95	9.5
Hillsboro	38	—17	10.2	1.10	11.0
Koepenick	.....	.....	.....	0.60	6.0
Lancaster	35	— 9	12.4	1.08	12.2
Madison	32	— 5	13.4	0.59	8.5
Manitowoc	35	— 5	14.4	0.73	9.0
Meadow Valley	37	—15	10.3	0.44	8.0
Medford	41	—19	9.7	0.35	3.5
Menasha	.....	.....	.....	0.25	5.5
Neillsville	34	—15	10.8	0.45	5.0
New London	31	— 9	12.2	0.41	7.0
Oconto	34	— 6	13.6	0.70	7.0
Osceola	34	—25	7.2	0.68	6.5
Pepin	42	—16	10.7	0.60	7.0
Pine River	35	—12	11.6	0.53	7.1
Portage	34	— 7	13.8	0.48	8.5
Port Washington	37	— 9	15.4	1.90	19.0
Prairie du Chien *a*	39	— 9	15.6	0.94	8.0
Prairie du Chien *b*	.....	.....	.....	0.65	10.5
Racine	34	— 7	16.6	1.62	15.0
Shawano	32	—11	12.8	0.40	4.0
Sheboygan	35	— 3	17.2	1.45	14.5
Spooner	38	—22	8.2	0.25	2.5
Stevens Point	.....	—17	.....	0.70	7.0
Valley Junction	34	—18[4]	12.1	0.66	7.5
Viroqua	34	— 9	12.2	1.37	13.0
Watertown	31	—10	11.2	1.59	16.0
Waukesha	31	— 6	13.2	1.23	13.5
Waupaca	30	—14	11.2	0.46	9.7
Wausaukee	35	—12°	11.6	0.80	8.0
Westbend	35	— 5	13.3	1.30	13.0
Westfield	35	— 8	13.4	0.90	9.0
Whitehall	32	—11	11.3	0.71	7.0
Wyoming.					
Alcova	54	—13	23.5	0.91	.....
Basin	.....	.....	.....	0.16	.....
Bedford	58	—20	20.8	2.11	17.1
Bigpiney	40	—32	6.6	1.20	12.0
Buffalo	63	—20	20.2	1.49	14.9
Burlington	65	—12	17.9	0.60	6.0
Wyoming—Cont'd.	°	°	°	*Ins.*	*Ins.*
Casper	56	—27	21.2	0.53	7.0
Centennial	42	—15	20.0	2.26	22.5
Chugwater	60	—10	23.9	0.45	4.5
Cody	68	—12	28.1	0.42	4.2
Daniel	.....	.....	.....	0.75	7.5
Evanston	51	—16	24.4	1.82	18.2
Fort Laramie	57	—24	19.2	0.85	13.0
Fort Washakie	68	—19	17.3	0.04	0.4
Fort Yellowstone	42	—15	18.0	0.72	7.2
Fourbear	57	—12	20.3	0.42	7.0
Griggs	.....	—25	.....	0.78	8.3
Hyattville	55	—12	21.4	0.12	3.0
Iron Mountain	53	—17	21.2	0.96	.....
Laramie	48	—21	19.4	0.41	.....
Lovell	62	.....	22.9	0.20	2.0
Lusk	49	—26	18 9	0.60	6.0
Myersville	49	—28	15.5	0.15	3.0
Parkman	64	—17	20.0	0.44	11.9
Pinebluff	55	—23	20.3	0.80	8.0
Rawlins	45	—22	19.8	2.07	20.7
Saratoga	45	—17	21.4	2.15	21.5
Sheridan	63	—24	19.5	0.95	9.5
South Pass City	40	— 8	19.7	0.45	4.5
Spring Hill	.....	.....	.....	0.15	1.5
Thermopolis	60	—16	19.8	0.90	9.0
Wheatland	56	—12	24.7	1.10	11.0
Cuba.					
Aguacate	91	45	69.4	2.58	
Australia	90	52	71.6	1.54	
Batabano	83	52	69.2	1.18	
Camajuani	88	47	68.8	1.61	
Cruces	.....	.....	.....	1.72	
Guabairo	.....	.....	.....	1.65	
Guanajay	86	52	69.9	1.71	
Guantanamo	91	55	73.9	0.13	
Guines	92	78	84.5	1.37	
Holguin	96	59	75.2	1.03	
Isabel, Guantanamo	.....	.....	.....	0.92	
Los Canos	92	50	73.1	0.10	
Magdalena	89	50	72.4	2.79	
Manzanillo	87	63	76.6	1.25	
Matanzas	90	46	69.3	0.60	
Moron Trocha	93	53	73.8	1.45	
Nuevitas	92[1]	60	76.9°	0.43	
Numero	92	48	70.1	1.35	
Pinar del Rio	88	51	71.1	1.34	
Romelle, Guantanamo	.....	.....	.....	2.89	
Sagua La Grande	90	50	72.7	1.09	
San Ceyetano	94	50	73.2	T.	
Santa Clara	93	46	70.8	1.94	
Sancti Spiritus	84	52	72.3	2.60	
Santa Cruz del Sur	85	58[1]	70.4°	.....	
Soledad	88	49	70.2	2.54	
Soledad, Guantanamo	93	54	73.9	T.	
Union de Reyes	85	56	69.8	1.83	
Yaguajay	93	53	72.7	2.04	
Yateras	.....	.....	.....	0.66	
Porto Rico.					
Adjuntas	.....	.....	.....	2.02	
Aguadilla	89	.....	...	1.14	
Arecibo	89	59	72.8	1.40	
Bayamon	96	57	76.6	0.70	
Caguas	86	58	73.6	0.09	
Canovanas	91	67	77.0	0.10	
Cayey	93	52	74.4	1.14	
Cidra	90	52	71.9	1.21	
Coamo	92	58	76.8	5.70	
Comerio	90	56	74.2	2.67	
Corozal	90	53	73.1	3.15	
Fajardo	91	61	77.6	1.34	
Hacienda Coloso	92	56	74.4	2.05	
Hacienda Perla	88	61	75.5	1.52	
Humacao	85	58	71.8	0.13	
Isabela	94	60	76.2	0.44	
Juana Diaz	93	52	75.2	0.20	
La Isolina	87	59	73.2	1.01	
Lajas	91	55	74.2	1.14	
Manati	93	57	75.9	0.76	
Maunabo	89	68	78.2	2.09	
Mayaguez	92	62	77.6	0.58	
Morovis	88	57	72.6	0.96	
Ponce	.....	.....	.....	1.38	
Port America	88	.....	.....	1.84	
San Lorenzo	92	55	74.7	1.40	
Utuado	90	56	73.7	0.49	
Yauco	88	61	74.9	1.50	
Mexico.					
Ciudad P. Diaz	85	31	54.8	0.12	
Coatzacoalcos	91	60	72.8	5.00	
Leon de Aldamas	79	38	58.4	0.67	
Puebla	74	42	57.7	0.83	
Tampico	87	47	65.6	1.01	
Topolobampo *1	88	49	65.2	0.40	
Vera Cruz	86	60	72.4	0.10	
New Brunswick.					
St. John	38	5	19.9	2.16	20.0

TABLE II.—*Climatological record of voluntary and other cooperating observers.—Late reports for January*, 1901.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Alabama.	°	°	°	*Ins.*	*Ins.*
Hamilton	70	20	43.4	6.48	
Alaska.					
Juneau	40	10	28.6	9.57	61.5
Sitka	48	18	34.0	9.33	9.0
Arizona.					
Bowie *[1]	76	28	46.6	1.16	
Natural Bridge	.....	.....	.....	2.43	T.
California.					
Calient* *[1]	65	30	45.4	0.89	
Folsom *[1]	64	27	47.4	5.00	
Lakeside	.....	.....	.....	1.94	
San Miguel Island	74	36	53.8	2.33	
Georgia.					
Lost Mountain	69°	22°	43.5°	5.38	
Indian Territory.					
Roff	74	.....	.. ..	T.	
Massachusetts.					
Turners Falls	44	—16	22.6	1.60	15.0
Webster	.....	.....	.....	1.40	4.5
Williamstown	39	— 6	22.0	1.69	10.0
Winchendon	...	.....	.....	1.84	15.0
Minnesota.					
Long Prairie	43	—26	9.5	0.22	4.2
Missouri.					
Princeton	57	— 1	30.0	0.35	1.8
Nebraska.					
Hay Springs [4]	57	—14	27.2	T.	T.
O'Neill	62	.....	.....	0.06	1.0
New Mexico.					
Alma	65	6	39.6	1.46	
North Carolina.					
Henderson	72	19	39.6	2.20	
Morganton	63	17	40.4	2.51	0.1
Shainghope *[1]	66	25	41.0	0.80	1.0
North Dakota.					
Buxton	.....	—21	.....	0.29	2.9
Melville	40	—21	8.2	0.02	0.2
Tennessee.					
Maryville	65	20	39.7	5.64	T.
Texas.					
Sanderson	74	16	54.0	0.30	
Virginia.					
Westpoint	66	11	36.5	2.08	8.0
Washington.					
Vashon	52	27	39.0	6.31	7.5
Wisconsin.					
Meadow Valley	46	—15	16.2	0.35	8.5
Wyoming.					
Parkman	59	—16	23.4	.....	.....
Isthmus of Panama.					
Alhajuela	89	65	78.1	0.20	
La Boca	87	72	79.9	.....	

EXPLANATION OF SIGNS.

* Extremes of temperature from observed readings of dry thermometer.

A numeral following the name of a station indicates the hours of observation from which the mean temperature was obtained, thus:

[1] Mean of 7 a. m. + 2 p. m. + 9 p. m. + 9 p. m. ÷ 4.
[2] Mean of 8 a. m. + 8 p. m. ÷ 2.
[3] Mean of 7 a. m. + 7 p. m. ÷ 2.
[4] Mean of 6 a. m. + 6 p. m. ÷ 2.
[5] Mean of 7 a. m. + 2 p. m. ÷ 2.
[6] Mean of readings at various hours reduced to true daily mean by special tables.
[7] Mean from hourly readings of thermograph.
[9] Mean of sunrise and noon.
[10] Mean of sunrise, noon, sunset, and midnight.

The absence of a numeral indicates that the mean temperature has been obtained from daily readings of the maximum and minimum thermometers.

An italic letter following the name of a station, as "Livingston *a*," "Livingston *b*," indicates that two or more observers, as the case may be, are reporting from the same station. A small roman letter following the name of a station, or in figure columns, indicates the number of days missing from the record; for instance "[a]" denotes 14 days missing.

No note is made of breaks in the continuity of temperature records when the same do not exceed two days. All known breaks, of whatever duration, in the precipitation record receive appropriate notice.

CORRECTIONS.

January, 1901, Brunswick, Mo., make mean temperature 31.4 instead of 31.8.

NOTE.—The following changes have been made in the names of stations: California, Volcano Springs changed to Volcano. Missouri, East Lynne changed to Eight Mile.

TABLE III.—*Resultant winds from observations at 8 a. m. and 8 p. m., daily, during the month of February, 1901.*

Stations.	Component direction from—				Resultant.	
	N.	S.	E.	W.	Direction from—	Duration.
New England.	*Hours.*	*Hours.*	*Hours.*	*Hours.*	°	*Hours.*
Eastport, Me	24	2	2	40	n. 60 w.	44
Portland, Me	19	6	1	44	n. 73 w.	45
Northfield, Vt	32	19	2	8	n. 25 w.	14
Boston, Mass	17	3	1	47	n. 73 w.	48
Nantucket, Mass	27	5	2	41	n. 61 w.	45
Block Island, R. I	28	3	2	42	n. 58 w.	47
New Haven, Conn	24	6	1	40	n. 66 w.	42
Middle Atlantic States.						
Albany, N. Y	25	10	2	29	n. 61 w.	31
Binghamton, N. Y †	9	2	5	16	n. 58 w.	13
New York, N. Y	26	4	2	40	n. 60 w.	44
Harrisburg, Pa †	9	4	3	19	n. 73 w.	17
Philadelphia, Pa	32	6	3	37	n. 52 w.	43
Scranton, Pa	22	13	5	30	n. 70 w.	27
Atlantic City, N. J	30	5	3	37	n. 53 w.	42
Cape May, N. J	25	7	4	34	n. 59 w.	35
Baltimore, Md	17	7	5	37	n 73 w.	34
Washington, D. C	28	7	7	24	n. 39 w.	27
Lynchburg, Va	21	11	4	37	n. 73 w.	34
Norfolk, Va	20	18	13	18	n. 68 w.	5
Richmond, Va	19	14	10	29	n. 75 w.	20
South Atlantic States.						
Charlotte, N. C	20	22	11	18	s. 74 w.	7
Hatteras, N. C	30	5	8	27	n. 41 w.	33
Raleigh, N. C	21	13	5	32	n. 73 w.	28
Wilmington, N. C	25	8	9	27	n. 47 w	25
Charleston, S. C	24	11	7	27	n. 57 w.	24
Augusta, Ga	18	10	7	32	n. 72 w.	26
Savannah, Ga	22	7	10	27	n. 48 w.	23
Jacksonville, Fla	26	13	8	27	n. 56 w.	23
Florida Peninsula.						
Jupiter, Fla	25	14	5	27	n. 64 w.	25
Key West, Fla	28	11	25	4	n. 51 e.	27
Tampa, Fla	28	14	11	17	n. 23 w.	15
Eastern Gulf States.						
Atlanta, Ga	22	8	6	35	n. 64 w.	32
Macon, Ga †	15	5	2	15	n. 52 w.	16
Pensacola, Fla †	18	3	9	3	n. 22 e.	16
Mobile, Ala	31	11	11	12	n. 3 w.	20
Montgomery, Ala	22	11	13	18	n. 24 w.	12
Meridian, Miss †	13	3	7	7	n.	10
Vicksburg, Miss	22	15	23	7	n. 66 e.	18
New Orleans, La	26	16	19	9	n. 45 e.	14
Western Gulf States.						
Shreveport, La	18	14	20	13	n. 60 e.	8
Fort Smith, Ark	22	7	16	18	n. 8 w.	15
Little Rock, Ark	26	13	13	21	n. 32 w.	15
Corpus Christi, Tex	26	15	20	8	n. 47 e.	16
Fort Worth, Tex †	25	13	15	16	n. 5 w.	12
Galveston, Tex	25	14	22	7	n. 54 e.	19
Palestine, Tex	26	12	17	10	n. 27 e.	16
San Antonio, Tex	31	12	20	4	w. 40 e.	25
Ohio Valley and Tennessee.						
Chattanooga, Tenn	22	13	6	30	n. 69 w.	26
Knoxville, Tenn	23	14	7	28	n. 67 w.	23
Memphis, Tenn	28	13	12	17	n. 18 w.	16
Nashville, Tenn	23	13	6	26	n. 63 w.	22
Lexington, Ky †	8	8	5	15	w.	10
Louisville, Ky	18	5	13	30	n. 52 w.	22
Evansville, Ind †	11	5	6	13	n. 49 w.	9
Indianapolis, Ind	15	11	10	31	n. 79 w.	21
Cincinnati, Ohio	15	11	14	29	n. 75 w.	16
Columbus, Ohio	10	18	9	33	s. 72 w.	25
Pittsburg, Pa	21	10	6	36	n. 70 w	32
Parkersburg, W. Va	18	13	6	31	n. 79 w.	23
Elkins, W. Va	12	12	2	41	w.	39
Lower Lake Region.						
Buffalo, N. Y	5	16	5	41	s. 73 w.	38
Oswego, N. Y	19	19	3	32	w.	28
Rochester, N. Y	10	20	3	39	s. 74 w.	37
Erie, Pa	12	11	4	39	n. 88 w.	35
Cleveland, Ohio	9	26	8	29	s. 51 w.	27
Sandusky, Ohio	8	13	8	38	s. 81 w.	30
Toledo, Ohio	8	18	8	35	s. 70 w.	29
Detroit, Mich	12	15	5	35	s. 84 w.	30
Upper Lake Region.						
Alpena, Mich	16	9	4	38	n. 78 w.	35
Escanaba, Mich	21	13	3	29	n. 73 w.	27
Grand Haven, Mich	22	11	13	24	n. 45 w.	16
Houghton, Mich. †	12	1	8	13	n. 34 w.	12
Marquette, Mich	11	10	6	41	n. 88 w.	35
Port Huron, Mich	9	12	5	39	s. 85 w.	34
Sault Ste. Marie, Mich	11	12	17	27	s. 84 w.	10
Chicago, Ill	20	10	8	29	n. 65 w.	23
Milwaukee, Wis	12	9	7	37	n. 84 w.	30
Green Bay, Wis	11	25	1	27	s. 62 w.	30
Duluth, Minn	24	8	8	35	n. 59 w.	31
North Dakota.						
Moorhead, Minn	21	16	11	24	n. 69 w.	14
Bismarck, N. Dak	32	8	10	28	n. 34 w.	32
Williston, N. Dak	25	9	2	30	n. 60 w.	32
Upper Mississippi Valley.						
St. Paul, Minn	21	14	10	28	n. 69 w.	19

Stations.	Component direction from—				Resultant.	
	N.	S.	E.	W.	Direction from—	Duration.
Upper Mississippi Valley.—Cont'd.	*Hours.*	*Hours.*	*Hours.*	*Hours.*	°	*Hours.*
La Crosse, Wis †	8	11	3	11	s. 60 w.	8
Davenport, Iowa	7	7	12	37	w.	25
Des Moines, Iowa	26	9	10	21	n. 33 w.	20
Dubuque, Iowa	16	16	10	27	w.	17
Keokuk, Iowa	21	11	10	31	n. 65 w.	23
Cairo, Ill	25	10	10	22	n. 39 w.	19
Springfield, Ill	25	10	10	28	n. 50 w.	23
Hannibal, Mo †	10	6	5	13	n. 63 w.	9
St. Louis, Mo	20	14	10	25	n. 68 w.	16
Missouri Valley.						
Columbia, Mo*	10	4	5	14	n. 56 w.	11
Kansas City, Mo	26	11	14	16	n. 8 w.	15
Springfield, Mo	21	15	10	18	n. 53 w.	10
Lincoln, Nebr	25	17	9	18	n. 48 w.	12
Omaha, Nebr	25	14	7	24	n 57 w.	20
Valentine, Nebr	24	6	5	32	n. 56 w.	32
Sioux City, Iowa †	15	7	4	10	n. 37 w.	10
Pierre, S. Dak	28	10	12	21	n. 27 w.	20
Huron, S. Dak	23	9	12	29	n. 51 w.	22
Yankton, S. Dak †	12	2	4	16	n. 50 w.	16
Northern Slope.						
Havre, Mont	13	13	14	30	w.	16
Miles City, Mont	23	21	8	18	n. 79 w.	10
Helena, Mont	19	19	1	31	w.	30
Kalispell, Mont	13	17	9	29	s. 79 w.	20
Rapid City, S. Dak	25	9	11	22	n. 34 w.	19
Cheyenne, Wyo	25	12	5	27	n. 60 w.	26
Lander, Wyo	13	28	9	24	s. 45 w.	21
North Platte, Nebr	17	14	8	28	n. 81 w.	20
Middle Slope.						
Denver, Colo	17	22	20	11	s. 61 e.	10
Pueblo, Colo	17	17	24	17	e.	7
Concordia, Kans	22	13	11	18	n. 38 w.	11
Dodge, Kans	29	10	14	18	n. 12 w.	19
Wichita, Kans	31	13	16	8	n. 24 e.	19
Oklahoma, Okla	29	16	11	9	n. 9 e.	13
Southern Slope.						
Abilene, Tex	24	16	12	18	n. 37 w.	10
Amarillo, Tex	21	23	13	16	s. 56 w	4
Southern Plateau.						
El Paso, Tex	18	7	16	26	n. 43 w.	15
Santa Fe, N. Mex	25	17	16	9	n. 41 e.	11
Flagstaff, Ariz	11	15	13	29	s. 76 w.	16
Phoenix, Ariz	10	11	33	11	s. 87 e.	22
Yuma, Ariz	23	15	15	12	n. 10 e.	11
Independence, Cal	27	14	5	23	n. 54 w.	22
Middle Plateau.						
Carson City, Nev	14	20	13	18	s. 40 w.	8
Winnemucca, Nev	11	19	14	22	s. 45 w.	11
Modena, Utah	16	9	12	26	n. 63 w.	16
Salt Lake City, Utah	18	16	17	20	n. 56 w.	4
Grand Junction, Colo	5	7	16	30	s. 82 e.	14
Northern Plateau.						
Baker City, Oreg	14	28	16	9	s. 27 e.	16
Boise, Idaho	15	14	14	26	n. 85 w.	12
Lewiston, Idaho †	3	5	30	4	s. 83 e.	16
Pocatello, Idaho	11	23	5	25	s. 59 w.	23
Spokane, Wash	17	18	24	9	s. 86 e.	15
Walla Walla, Wash	3	46	7	8	s. 1 w.	43
North Pacific Coast Region.						
Neah Bay, Wash	2	4	36	17	s. 84 e.	19
Port Crescent, Wash *	0	6	18	8	s. 59 e.	12
Seattle, Wash	19	22	18	10	s. 69 e.	8
Tacoma, Wash	17	24	15	9	s. 41 e.	9
Astoria, Oreg	13	12	28	14	n. 83 e.	14
Portland, Oreg	19	18	16	17	n. 45 w.	1
Roseburg, Oreg	19	14	12	21	s. 61 w.	10
Middle Pacific Coast Region.						
Eureka, Cal	14	20	18	19	s. 9 w.	6
Mount Tamalpais, Cal	27	14	7	26	n. 56 w.	23
Red Bluff, Cal	30	15	14	8	n. 22 e.	16
Sacramento, Cal	21	25	16	11	s. 51 e.	6
San Francisco, Cal	14	18	10	24	s. 74 w.	15
South Pacific Coast Region.						
Fresno, Cal	12	14	19	19	s.	2
Los Angeles, Cal	18	15	16	28	n. 67 w.	8
San Diego, Cal	25	10	16	21	n. 18 w.	16
San Luis Obispo, Cal	26	14	2	19	n. 55 w.	21
West Indies.						
Basseterre, St. Kitts Island	14	8	38	4	n. 80 e.	34
Bridgetown, Barbados	14	3	49	0	n. 77 e.	50
Cienfuegos, Cuba	28	12	29	4	n. 57 e.	30
Grand Turk, Turks Island, W. I †	6	10	13	2	s. 70 e.	12
Havana, Cuba	18	14	26	7	n. 78 e.	19
Kingston, Jamaica	42	1	20	2	n. 24 e.	45
Port of Spain, Trinidad	15	6	43	1	n. 78 e.	43
Puerto Principe, Cuba	27	6	26	10	n. 37 e.	26
Roseau, Dominica, W. I	14	7	42	2	n. 80 e.	41
San Juan, Porto Rico	9	30	30	3	s. 52 e.	34
Santiago de Cuba, Cuba	18	25	23	4	s. 69 e.	19
Santo Domingo, S. Domingo, W. I.	35	12	12	5	n. 17 e.	24
Willemstad, Curaçao	2	3	54	0	s. 89 e.	54

* From observations at 8 p. m. only.

† From observations at 8 a. m. only.

TABLE IV.—*Thunderstorms and auroras, February, 1901.*

States.	No. of stations.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total. No.	Total. Days.	
Alabama	52	T.	....	1	6	...	....	....	1	7	1	....	....	...	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	16	5	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Arizona	56	T.	6	....	....	1	1	6	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	6	....	....	....	....	....	....	20	5	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Arkansas	57	T.	....	6	6	....	....	....	....	7	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	9	....	....	28	4	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
California	167	T.	....	....	...	1	11	1	....	3	1	....	....	...	....	....	....	....	....	....	....	....	....	....	30	....	....	....	....	....	....	....	47	6	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	1	1	A.
Colorado	81	T.	...	....	....	...	...	....	....	....	....	....	..	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	T.
		A.	....	....	....	....	....	..	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Connecticut	21	T.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	T.
		A.	....	....	....	....	....	....	....	....	....	....	..	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Delaware	5	T.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Dist. of Columbia	4	T.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	T.
		A.	....	....	....	...	....	...	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Florida	47	T.	....	....	..	3	....	...	1	3	3	....	2	....	....	....	....	....	....	2	13	1	....	....	2	....	1	3	....	....	....	....	34	11	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Georgia	55	T.	....	....	12	....	....	....	....	4	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	19	3	T.
		A.	....	....	....	....	....	..	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Idaho	34	T.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	T.
		A.	....	....	....	....	....	....	..	..	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Illinois	92	T.	....	2	6	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	8	2	T.
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Indiana	58	T.	....	....	17	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	17	1	T.
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Indian Territory	11	T.	1	5	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	9	3	T.
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Iowa	149	T.	....	....	1	....	....	....	....	....	..	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	1	T.
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Kansas	77	T.	...	...	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	3	....	1	1	....	....	6	4	T.
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Kentucky	41	T.	....	....	6	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	7	2	T.
		A.	....	...	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Louisiana	46	T.	....	2	6	....	....	....	5	4	....	....	1	....	....	....	....	....	....	....	....	....	....	1	....	1	1	1	1	8	....	....	31	11	T.
		A.	....	....	....	....	....	..	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Maine	19	T.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	T.
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Maryland	48	T.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	T.
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Massachusetts	48	T.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	T.
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Michigan	106	T.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	T.
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Minnesota	67	T.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Mississippi	44	T.	....	5	8	....	....	....	2	3	....	....	....	1	....	....	....	1	....	1	....	....	....	....	....	....	....	....	....	8	....	....	29	8	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Missouri	95	T.	....	....	4	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	6	....	....	10	2	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Montana	40	T.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	1	T.
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Nebraska	142	T.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	1	1	T.
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Nevada	40	T.	..	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	1	...	....	....	....	....	....	2	2	T.
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New Hampshire	19	T.	....	....	....	....	....	....	....	....	....	....	..	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	T.
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New Jersey	51	T.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
New Mexico	31	T.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	3	....	....	....	....	....	....	3	1	T.
		A.	..	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
New York	99	T.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	T.
		A.	....	....	....	....	....	...	1	..	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	2	2	A.
North Carolina	56	T.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
North Dakota	48	T.	...	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	1	1	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Ohio	128	T.	....	....	16	2	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	19	3	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	1	1	....	....	....	....	....	....	....	3	3	A.
Oklahoma	23	T.	....	3	2	....	....	....	..	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	6	3	T.
		A.	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	1	....	....	....	3	3	A.
Oregon	74	T.	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	2	2	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Pennsylvania	91	T.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Rhode Island	7	T.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	1	1	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
South Carolina	46	T.	...	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	2	2	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
South Dakota	56	T.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	T.
		A.	...	....	...	....	1	....	....	....	...	1	1	....	....	..	....	....	....	1	1	....	....	....	....	....	....	....	....	....	....	....	5	2	A.
Tennessee	56	T.	...	....	3	....	....	...	....	....	....	....	..	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	3	....	....	6	2	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Texas	95	T.	1	10	2	1	1	1	....	...	1	1	1	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	6	....	....	26	11	T.
		A.	..	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Utah	47	T.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	1	....	....	....	....	....	....	2	2	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Vermont	16	T.	....	....	...	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Virginia	50	T.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Washington	64	T.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2	....	....	....	....	....	....	....	....	....	....	1	....	....	....	3	2	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
West Virginia	43	T.	....	....	....	..	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Wisconsin	60	T.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	2	2	A.
Wyoming	31	T.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	1	....	....	....	2	2	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Sums	2,893	T.	8	35	99	2	13	8	2	31	10	1	4	2	0	0	0	5	0	4	13	2	0	1	33	13	5	6	4	42	0	0	0	357	....	T.
		A.	0	0	0	1	1	0	1	0	0	1	1	1	0	1	0	0	0	2	1	0	2	2	1	1	1	0	2	1	0	0	0	20	....	A.

TABLE V.—*Accumulated amounts of precipitation for each 5 minutes, for storms in which the rate of fall equaled or exceeded 0.25 in any 5 minutes, or 0.75 in 1 hour during February, 1901, at all stations furnished with self-registering gages.*

Stations.	Date.	Total duration.		Total am't of precipitation.	Excessive rate.		Amount before excessive began.	Depths of precipitation (in inches) during periods of time indicated.												
		From—	To—		Began—	Ended—		5 min.	10 min.	15 min.	20 min.	25 min.	30 min.	35 min.	40 min.	45 min.	50 min.	60 min.	80 min.	100 min.	120 min.
	1	2	3	4	5	6	7														
Albany, N. Y.	3-4			0.54														*			
Alpena, Mich.	9			0.20														*			
Atlanta, Ga.	3			2.58														0.49			
Atlantic City, N. J.	3-4			0.70														0.21			
Baltimore, Md.	3-4			0.57														*			
Binghamton, N. Y.	3-4			0.45														*			
Bismarck, N. Dak.	27			0.08														*			
Boise, Idaho	19			0.50														0.08			
Boston, Mass.	4-5			0.50														0.12			
Buffalo, N. Y	3-4			0.88														*			
Cairo, Ill.	2-3			1.22														0.30			
Charleston, S. C.	23			0.77														0.19			
Chicago, Ill.	3-4			1.14														*			
Cincinnati, Ohio	2-3			0.76														0.16			
Cleveland, Ohio	3-4			0.61														0.12			
Columbia, Mo.	2-3			1.20														*			
Columbus, Ohio	2-3			0.65														0.26			
Denver, Colo.	7-8			0.03														*			
Des Moines, Iowa	8			0.79														0.12			
Detroit, Mich.	3-4			1.08														*			
Dodge, Kans	2			0.34														*			
Duluth, Minn.	7-8			0.51														*			
Eastport, Me.	24			0.67														*			
Elkins, W. Va	4			0.20														0.09			
Erie, Pa.	3-4			0.44														*			
Escanaba, Mich.	17-18			0.15														*			
Evansville, Ind	28			0.60														*			
Fort Worth, Tex.	2			0.30														0.24			
Fresno, Cal.	4-5			0.65														*			
Galveston, Tex.	28	9.25 p. m.	11.20 p. m.	0.80	10.05 p. m.	10.43 p. m.	0.06	0.08	0.13	0.17	0.21	0.28	0.44	0.62	0.66						
Grand Junction, Colo.	2-3			0.13														0.06			
Harrisburg, Pa	3-4			0.39														*			
Hatteras, N. C.	9			0.73														0.40			
Huron, S. Dak.	16-17			0.14														*			
Indianapolis, Ind.	8-9			0.41														0.17			
Jacksonville, Fla.	19	D. N.	11.30 a. m.	2.65	9.25 a. m.	9.55 a. m.	1.64	0.05	0.27	0.44	0.59	0.67	0.71	0.74	0.77						
Jupiter, Fla.	19			0.40														0.27			
Kalispell, Mont	19-20			0.42														*			
Kansas City, Mo.	1-3			1.00														*			
Key West, Fla.	19			0.41														0.35			
Knoxville, Tenn	3			0.64														0.23			
Lexington, Ky.	3-4			0.41														0.12			
Lincoln, Nebr.	2-3			0.56														*			
Little Rock, Ark.	2-3			0.85														0.43			
Los Angeles, Cal.	4-5			2.42														0.68			
Louisville, Ky.	2-3			0.85														0.20			
Macon, Ga.	8-9	9.23 p. m.	2.04 a. m.	1.46	12.10 a. m.	12.35 a. m.	0.68	0.12	0.24	0.42	0.55	0.59	0.61								
Memphis, Tenn.	2-3			1.06														0.27			
Meridian, Miss.	7			1.73														0.37			
Milwaukee, Wis.	8-9			0.88														0.10			
Montgomery, Ala	3	10.16 a. m.	2.45 p. m.	1.24	12.40 p. m.	12.55 p. m.	0.45	0.15	0.47	0.53	0.56	0.58									
	8	4.57 p. m.	11.27 p. m.	1.02	9.25 p. m.	9.45 p. m.	0.22	0.05	0.12	0.45	0.66	0.69	0.72	0.74							
Nantucket, Mass.	23-24			0.80														0.11			
Nashville, Tenn.	2-3			1.30														0.43			
New Haven, Conn.	4			0.41														*			
New Orleans, La.	12			0.70														0.51			
New York, N. Y.	3-4			0.53														0.08			
Norfolk, Va.	9			0.36														0.12			
Northfield, Vt.	4-5			0.13														*			
Oklahoma, Okla.	2			0.15														0.10			
Omaha, Nebr.	2-3			0.36														0.09			
Parkersburg, W. Va.	3-4			0.80														0.09			
Philadelphia, Pa.	3-4			0.74														0.18			
Pittsburg, Pa.	8-9			0.24														*			
Pocatello, Idaho	7			0.26														*			
Portland, Me.	4-5			1.42														*			
Portland, Oreg.	15-16			2.38														0.18			
Pueblo, Colo.	22			0.03														*			
Raleigh, N. C.	8-9			0.37														0.11			
Richmond, Va.	19			0.11														0.09			
Rochester, N. Y.	3-5			1.18														*			
St. Louis, Mo.	2-3			1.16														0.24			
St. Paul, Minn	17			0.28														0.10			
Salt Lake City, Utah	16-17			0.86														*			
San Diego, Cal.	8-9	9.20 p. m.	9.20 a. m.	1.54	10.20 p. m.	10.55 p. m.	0.18	0.07	0.16	0.34	0.42	0.50	0.56	0.68	0.72						
Sandusky, Ohio	3-4			0.49														*			
San Francisco, Cal.	23			1.95														0.40			
Savannah, Ga.	11-12			1.17														0.41			
Seattle, Wash.	12-13			1.15														0.20			
Spokane, Wash.	15-16			0.83														*			
Tampa, Fla.	26			0.52														0.35			
Toledo, Ohio	2-3			0.65														*			
Topeka, Kans.	3			0.87														*			
Vicksburg, Miss.	3	5.15 a. m.	10.35 a. m.	1.04	7.25 a. m.	7.45 a. m.	0.11	0.14	0.38	0.67	0.81	0.83									
Washington, D. C.	3-4			0.48														0.12			
Wilmington, N. C.	3			0.71														0.36			
Yankton, S. Dak	7-8			0.50														*			
Basseterre, St. Kitts	3-4			1.11														0.28			
Bridgetown, Barbados	11			0.14														0.10			
Cienfuegos, Cuba	15	12.45 p. m.	1.15 p. m.	0.59	12.45 p. m.	1.05 p. m.	0.00	0.19	0.29	0.46	0.58										
	19	10.20 p. m.	11.00 p. m.	1.07	10.21 p. m.	11.00 p. m.	T	0.07	0.28	0.54	0.64	0.71	0.74	0.93	1.07						
Havana, Cuba	26			0.83														0.41			
Kingston, Jamaica	4			0.01																	
Port of Spain, Trin.	3			0.20														0.09			
Puerto Principe, Cuba	20			0.05														0.05			
Roseau, Dominica	2			0.12														0.12			
San Juan, Porto Rico	27			0.40														0.35			
Santiago de Cuba	19-20			0.66														0.32			
Santo Domingo, S. D.	24			0.55														0.34			
Willemstad, Curaçao	3			0.14														0.11			

*Self register not working.

TABLE VI.—*Data furnished by the Canadian Meteorological Service, February*, 1901.

Stations.	Pressure.			Temperature.				Precipitation.		
	Mean not reduced.	Mean reduced.	Departure from normal.	Mean.	Departure from normal.	Mean maximum.	Mean minimum.	Total.	Departure from normal.	Depth of snow.
	Ins.	*Ins.*	*Ins.*	°	°	°	°	*Ins.*	*Ins.*	*Ins.*
St. Johns, N. F.	29.15	29.30	−.55	31.9	+ 9.9	35.7	28.2	5.22	+0.27	3.7
Sydney, C. B. I.	29.35	29.39	−.56	27.1	+ 7.8	33.4	20.9	6.13	+1.94	36.5
Halifax, N. S.	29.38	29.49	−.49	26.1	+ 3.7	31.9	20.3	0.97	−3.73	9.1
Grand Manan, N. B.	29.52	29.57	−.41	21.5	− 1.9	28.2	14.8	2.07	−1.49	20.7
Yarmouth, N. S.	29.49	29.57	−.47	24.7	− 1.1	29.4	20.0	3.05	−2.77	27.5
Charlottet'n, P. E. I.	29.40	29.44	−.48	21.8	+ 4.2	28.0	15.7	2.08	−1.62	18.0
Chatham, N. B.	29.47	29.49	−.47	17.4	+ 4.9	26.0	8.7	3.16	−0.15	30.4
Father Point, Que.	29.58	29.61	−.40	14.5	+ 3.0	21.2	7.8	3.17	+1.55	31.7
Quebec, Que.	29.38	29.74	−.30	11.3	− 0.5	18.5	4.2	1.16	−2.23	11.6
Montreal, Que.	29.61	29.84	−.21	12.4	− 2.1	18.4	6.3	2.01	−0.81	22.4
Bissett, Ont.	29.30	29.96	−.10	5.4	− 4.5	19.6	− 8.9	0.21	−2.11	2.1
Ottawa, Ont.	29.51	29.85	−.21	11.4	− 0.3	20.8	1.9	0.80	−1.89	8.0
Kingston, Ont.	29.57	29.91	−.17	14.9	− 2.9	23.1	6.7	1.09	−1.35	10.9
Toronto, Ont.	29.57	29.98	−.11	16.6	− 4.9	24.3	8.9	1.44	−0.87	14.4
White River, Ont.	28.60	30.08	−.00	−1.2	− 1.4	15.7	−18.1	0.87	−0.35	8.7
Port Stanley, Ont.	29.34	30.03	−.05	15.4	− 7.4	24.5	6.4	2.66	−0.26	26.6
Saugeen, Ont.	29.22	29.99	−.07	16.7	− 3.2	24.1	9.3	3.91	+1.47	39.1
Parry Sound, Ont.	29.22	29.97	−.10	9.5	− 4.8	21.8	− 2.8	4.24	+1.84	42.4
Port Arthur, Ont.	29.31	30.07	−.03	5.6	− 0.8	15.7	− 4.5	0.06	−1.27	0.6
Winnipeg, Man.	29.30	30.21	+.04	0.1	+ 1.7	11.2	−11.0	0.90	−0.27	9.0
Minnedosa, Man.	28.21	30.18	+.02	3.6	+ 6.3	14.6	− 7.3	0.38	−0.60	3.8
Qu'Appelle, Assin.	27.74	30.18	+.03	3.0	+ 3.6	12.0	− 5.9	1.59	+0.92	15.9
Medicine Hat, Assin.	27.78	30.22	+.07	14.9	+ 3.7	24.5	5.3	1.40	+0.96	14.0
Swift Current, Assin.	27.47	30.23	+.08	9.4	+ 1.4	17.7	1.2	0.50	−0.26	5.0
Calgary, Alberta	26.41	30.13	+.13	15.6	+ 2.1	25.2	5.9	1.02	+0.26	10.2
Banff, Alberta	25.33	30.19	+.10	16.4	. ....	26.2	6.7	0.80	−0.34	7.0
Edmonton, Alberta	27.71	30.15	+.04	14.9	+ 6.6	25.4	4.4	1.50	+1.04	15.0
Prince Albert, Sask.	28.49	30.16	+.03	3.4	+ 6.4	14.9	− 8.1	1.03	+0.30	10.3
Battleford, Sask.	28.34	30.23	+.10	4.1	+ 4.0	14.4	− 6.2	0.26	−0.31	2.6
Kamloops, B. C.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Victoria, B. C.	29.93	30.03	+.01	41.1	+ 1.6	45.8	36.3	3.36	−0.75	1.8
Barkerville, N. W. T.	25.56	30.06	.....	19.2	+ 0.3	28.7	9.6	1.22	−1.53	10.0
Hamilton, Bermuda.	29.72	29.88	−.20	59.5	− 2.0	64.3	54.6	5.56	+1.16	

TABLE VII.—*Heights of rivers referred to zeros of gages, February, 1901.*

Stations.	Distance to mouth of river.	Danger line on gage.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
Mississippi River.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
St. Paul, Minn. [6]	1,954	14	.....	.....	.....	.....	.....	.....
Reeds Landing, Minn [1]	1,884	12	— 0 7	12,13,19-23	— 0.9	27, 28	—0.8	0.2
La Crosse, Wis.	1,819	12	3.2	1, 28	2.7	22-24	3.0	0.5
Prairie du Chien, Wis. *	1,759	18	.....	.....	.....	.....	.....	.....
Dubuque, Iowa. *	1,669	15	.....	.....	.....	.....	.....	.....
Leclaire, Iowa. *	1,609	10	.....	.....	.....	.....	.....	.....
Davenport, Iowa *	1,593	15	.....	.....	.....	.....	.....	.....
Muscatine, Iowa	1,562	16	4.5	6	3.6	1, 27, 28	3.9	0.9
Galland, Iowa [7]	1,472	8	1.4	11, 12	0.6	4	1.1	0.8
Keokuk, Iowa [7]	1,463	15	6.2	14	— 0.2	4	2.7	6.4
Hannibal, Mo	1,402	13	1.9	19, 20	— 0.6	7	1 3	2.5
Grafton, Ill	1,306	23	4.4	1	2.7	9	3.7	1.7
St. Louis, Mo	1,264	30	5 2	27	1.7	10	3.4	3.5
Chester, Ill.	1,189	36	3.0	28	0.8	11	1.9	2.2
Memphis, Tenn	845	35	13.5	12	5.1	28	9.9	8.4
Helena, Ark	767	42	20.1	13	10.6	28	16.2	9.5
Arkansas City, Ark	645	42	22.2	15, 16	13.6	28	18.9	8.6
Greenville, Miss	595	42	18.3	15, 16	11.1	28	15.5	7.2
Vicksburg, Miss	474	45	21.6	1	14.4	28	18.5	7.2
New Orleans, La	108	16	7.8	3, 19	6.4	10, 28	7.1	1.4
Missouri River.								
Bismarck, N. Dak.	1,369	14	3.4	8-11	2.5	1	3.0	0.9
Pierre, S. Dak. *	1,114	14	.....	.....	.....	.....	.....	.....
Sioux City, Iowa *	784	19	.....	.....	.....	.....	.....	.....
Omaha, Nebr. [6]	669	18	7.1	23	5.9	18, 19	6 4	1.2
St. Joseph, Mo.	481	10	5.4	25	0.1	4 7	1.4	5.3
Kansas City, Mo.	398	21	12.2	26	5.7	2	7.7	6.5
Boonville, Mo	199	30	5.2	23	1.3	10, 11	2.8	3.9
Hermann, Mo.	103	24	5.7	25	3.0	14, 15	4.0	2 7
Des Moines River.								
Des Moines, Iowa *	165	19	.....	.....	.....	.....	.....	.....
Illinois River.								
Peoria, Ill.	135	14	8.7	22, 23	8.1	4, 5	8 4	0 6
Youghiogheny River.								
Confluence, Pa.	59	10	2.0	1, 4	1.1	28	1.6	0.9
West Newton, Pa. [2]	15	23	2.7	9	1.0	2, 3	1 7	1.7
Allegheny River.								
Warren, Pa	177	14	2.2	1-4	1.7	26-28	1.9	0.5
Oil City, Pa	123	13	3.0	9	1.9	28	2.4	1.1
Parker, Pa	73	30	2.0	1	1.2	22, 23	1.5	0.8
Monongahela River.								
Weston, W. Va.	161	18	6.6	4	— 0 2	21-23	0 4	6.8
Fairmont, W. Va.	119	25	7.5	5	0 9	23	1.8	6.6
Greensboro, Pa. [3]	81	18	11.3	5	7.5	28	8.3	3 8
Lock No. 4, Pa.	40	28	13.2	6	7.0	28	8.3	6.2
Conemaugh River.								
Johnstown, Pa.	64	7	1.8	1	1.2	15, 16	1.4	0.6
Red Bank Creek.								
Brookville, Pa	35	8	1.6	1-28	1.6	1-28	1.6	0.0
Beaver River.								
Ellwood Junction, Pa. *	10	14	.....	.....	.....	.....	.....	.....
Great Kanawha River.								
Charleston, W. Va.	61	30	8 4	5	3.6	26, 27	5.5	4.8
Little Kanawha River.								
Glenville, W. Va.	100	24	6.8	4	— 0.8	28	1.6	7.6
New River.								
Hinton, W. Va.	95	14	3.5	11	1.6	25	2 4	1.9
Cheat River.								
Rowlesburg, W. Va. *	36	14	.....	.....	.....	.....	.....	.....
Ohio River.								
Pittsburg, Pa	906	22	6.0	6	1.1	26-28	2 6	4.9
Davis Island Dam, Pa	900	25	7.2	6	3.6	26-28	4 6	3.6
Wheeling, W. Va.	875	36	8.4	24-26	4.5	18, 20	5.9	3 9
Parkersburg, W. Va. [4]	785	36	9.8	5	4.8	27	7 2	5.0
Point Pleasant, W. Va.	703	39	13.5	6	3 7	26-28	7.1	9.8
Huntington, W. Va.	690	50	18.0	6	6.8	27, 28	10.9	11.2
Catlettsburg, Ky.	651	50	18 4	6	4.5	27, 28	10.2	13.9
Portsmouth, Ohio	612	50	18 9	7	6 5	27, 28	11.4	12.4
Cincinnati, Ohio	469	50	20.9	8	8.3	28	13 8	12 6
Madison, Ind	413	46	18 0	9	8.5	28	12.9	9.5
Louisville, Ky.	367	28	8 8	9	5.2	28	7 0	3.6
Evansville, Ind	184	35	15.5	11	7.0	28	11.3	8.5
Paducah, Ky.	47	40	18.5	9	6 3	28	13.2	12,2
Cairo, Ill	1,073	45	21.3	9	10.4	27, 28	16.4	10 9
Muskingum River.								
Zanesville, Ohio.	70	30	10.0	6	6.7	27, 28	7.7	3.3
Scioto River.								
Columbus, Ohio *	110	17	.....	.....	.....	.....	.....	.....
Miami River.								
Dayton, Ohio	69	18	2 6	6, 7	1 2	1, 2	1.6	1.4
Wabash River.								
Mount Carmel, Ill. [4]	50	15	4.7	8	2 3	1, 2	3.4	2 4
Licking River.								
Falmouth, Ky.	30	25	7.0	4	1.7	2, 3, 27, 28	3.1	5.3
Clinch River.								
Speers Ferry, Va	156	30	3.2	5	0 2	25, 26, 28	1.1	3 0
Clinton, Tenn.	46	25	10.5	7	4 0	27	6.5	6.5
Tennessee River.								
Knoxville, Tenn.	614	29	5.0	6	1.4	27	2.9	3.6
Kingston, Tenn	544	25	5.8	5	2.0	28	3.7	3.8
Chattanooga, Tenn.	430	33	10 1	5	3.7	28	6.5	6.4
Bridgeport, Ala.	390	24	8.2	5	2.1	28	4.7	6.1
Florence, Ala.	230	16	10.7	5	2.6	28	6 1	8.1
Riverton, Ala.	190	25	16.0	6	3 1	28	8 5	12.9

Stations.	Distance to mouth of river.	Danger line on gage.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
Tennessee River—Cont'd.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
Johnsonville, Tenn.	94	20	18.1	7	4.8	28	10.5	13.3
Cumberland River.								
Burnside, Ky.	434	50	12.8	5	3.0	1	5.5	9.8
Carthage, Tenn	257	40	14.5	5	3.1	28	7.1	11.4
Nashville, Tenn	175	40	19.6	6	4.8	28	10.9	14.8
Clarksville, Tenn.	138	42	25.5	5	7.1	28	14.4	18.4
Arkansas River.								
Wichita, Kans	726	10	1.9	3-8	1.7	15-22, 25-27	1.8	0.2
Webbers Falls, Ind. T.	413	23	4.1	8	2 0	1-3	2.9	2.1
Fort Smith, Ark.	351	22	4.9	9	2.4	2	3.5	2.5
Dardanelle, Ark.	256	21	4.3	11	2.4	1, 2	3.2	1.9
Little Rock, Ark.	176	23	7.2	12, 13	3.5	1, 2	5.4	3.7
White River.								
Newport, Ark.	150	26	8.0	5	3.0	2	5.7	5.0
Yazoo River.								
Yazoo City, Miss.	80	25	18.2	4	16.2	28	17.4	2.0
Red River.								
Arthur City, Tex.	688	27	6.0	5	4.4	27, 28	4.7	1.6
Fulton, Ark.	565	28	11.0	8, 9	4.2	2, 3	7.5	6 8
Shreveport, La	449	29	7.3	10, 11	2.0	5-8	4.7	5 3
Alexandria, La	139	33	12.0	14	2.5	2	7.6	9.5
Ouachita River.								
Camden, Ark	340	39	17.4	7	7.3	1	11.5	10.1
Monroe, La	100	40	18.9	19, 20	12.7	4	16.6	6.2
Atchafalaya River.								
Melville, La.	100	31	24.0	20	20.7	8	22.5	3.3
Susquehanna River.								
Wilkesbarre, Pa.	178	14	7.5	1, 2	4.1	20-28	5.3	3.4
Harrisburg, Pa.	70	17	4.0	2	1.8	27, 28	2 7	2.2
W. Br. of Susquehanna.								
Williamsport, Pa.	35	20	2 5	7	0.9	25, 26	1.4	1.6
Juniata River.								
Huntingdon, Pa. [6]	80	24	.....	.....	.....	.....	.....	.....
Potomac River.								
Harpers Ferry, W. Va.	170	16	2.9	1-5	1.8	24-28	2.4	1.1
James River.								
Lynchburg, Va	257	18	1.5	10	0 4	28	1.0	1.1
Richmond, Va.	110	12	— 0.4	17, 21, 26-28	— 1.0	1, 4-8, 11, 12	—0.7	0.6
Roanoke River.								
Weldon, N. C.	90	40	9.9	11, 12	8.3	26-28	8.9	1.6
Cape Fear River.								
Fayetteville, N. C.	100	38	11.2	11	3.9	28	6.5	8.3
Edisto River.								
Edisto, S. C.	75	6	5.6	14	4.3	1	4.9	1.3
Cheraw, S. C.	145	27	11.2	5	1.8	28	4.0	9.4
Black River.								
Kingstree, S. C.	60	12	10.1	14, 15	8.0	27, 28	9.0	2.1
Lynch Creek.								
Effingham, S. C.	35	12	10.9	12	5.4	20	7.3	4.9
Santee River.								
St. Stephens, S. C.	50	12	9.3	15	6 2	28	8.0	3.1
Congaree River.								
Columbia, S. C.	37	15	11.7	5	0.3	28	2.2	11.4
Wateree River.								
Camden, S. C.	45	24	20.0	5	4.4	24, 25, 28	7.4	15.6
Waccamaw River.								
Conway, S. C.	40	7	5.1	22	3.9	2, 3, 6, 7	4.6	1.2
Savannah River.								
Calhoun Falls, S. C.	347	.....	6.6	4	2 8	22, 23, 28	3.4	3.8
Augusta, Ga.	268	32	27.3	5	8.5	25, 26	12.1	18.8
Broad River.								
Carlton, Ga	30	.....	7.9	4	2.7	21-23, 26-28	3.5	5.2
Flint River.								
Albany, Ga	80	20	15.3	14	4.9	1	9.9	10.4
Chattahoochee River.								
Westpoint, Ga	230	20	13.8	5	3.8	23, 24	5.6	10.0
Ocmulgee River.								
Macon, Ga.	125	20	15 9	5	4.2	22, 23	7.1	11.7
Oconee River.								
Dublin, Ga.	60	30	15.8	10	4.2	23	8.3	11.6
Coosa River.								
Rome, Ga	223	30	18.0	5	3.0	28	6.7	15.0
Gadsden, Ala	144	18	17.0	6	2.8	28	8.6	14.2
Alabama River.								
Montgomery, Ala.	265	35	30.0	6	7.5	27, 28	15.8	22.5
Selma, Ala.	212	35	35.7	10	11.2	25	21.7	24.5
Tombigbee River.								
Columbus, Miss.	303	33	15 9	8	1.0	24, 25, 28	7.3	14.9
Demopolis, Ala.	155	35	42.2	11	10.3	28	28.1	31.9
Black Warrior River.								
Tuscaloosa, Ala	129	43	42.0	5	7.9	28	19.6	34.1
Brazos River.								
Kopperl, Tex.	369	21	— 0.2	1-28	— 0.2	1-28	—0.2	0.0
Waco, Tex	301	22	1.4	13-28	0.8	1-7	1.2	0.6
Columbia River.								
Umatilla, Oreg	270	25	7.8	28	1.1	10-14	2.7	6.7
The Dalles, Oreg	166	40	12.8	28	2.3	12, 13	6.1	10.5
Willamette River.								
Albany, Oreg	99	20	26.0	18	3.2	11, 12	9.1	22.8
Portland, Oreg	10	15	14.9	20	2.3	13	7.5	12.6
Sacramento River.								
Red Bluff, Cal.	241	23	20.1	20	4.3	1, 2	10.7	15.8
Sacramento, Cal.	70	29	28.2	25	21.0	4	23.5	7.2

* Frozen. [1] Frozen for 11 days. [2] Frozen for 17 days. [3] Frozen for 2 days. [4] Frozen for 1 day. [5] Frozen for 5 days. [7] Frozen for 8 days.

XXIX—13.

Chart I. Tracks of Centers of High Areas. February, 1901.

Chart I. Tracks of Centers of High Areas. February, 1901.

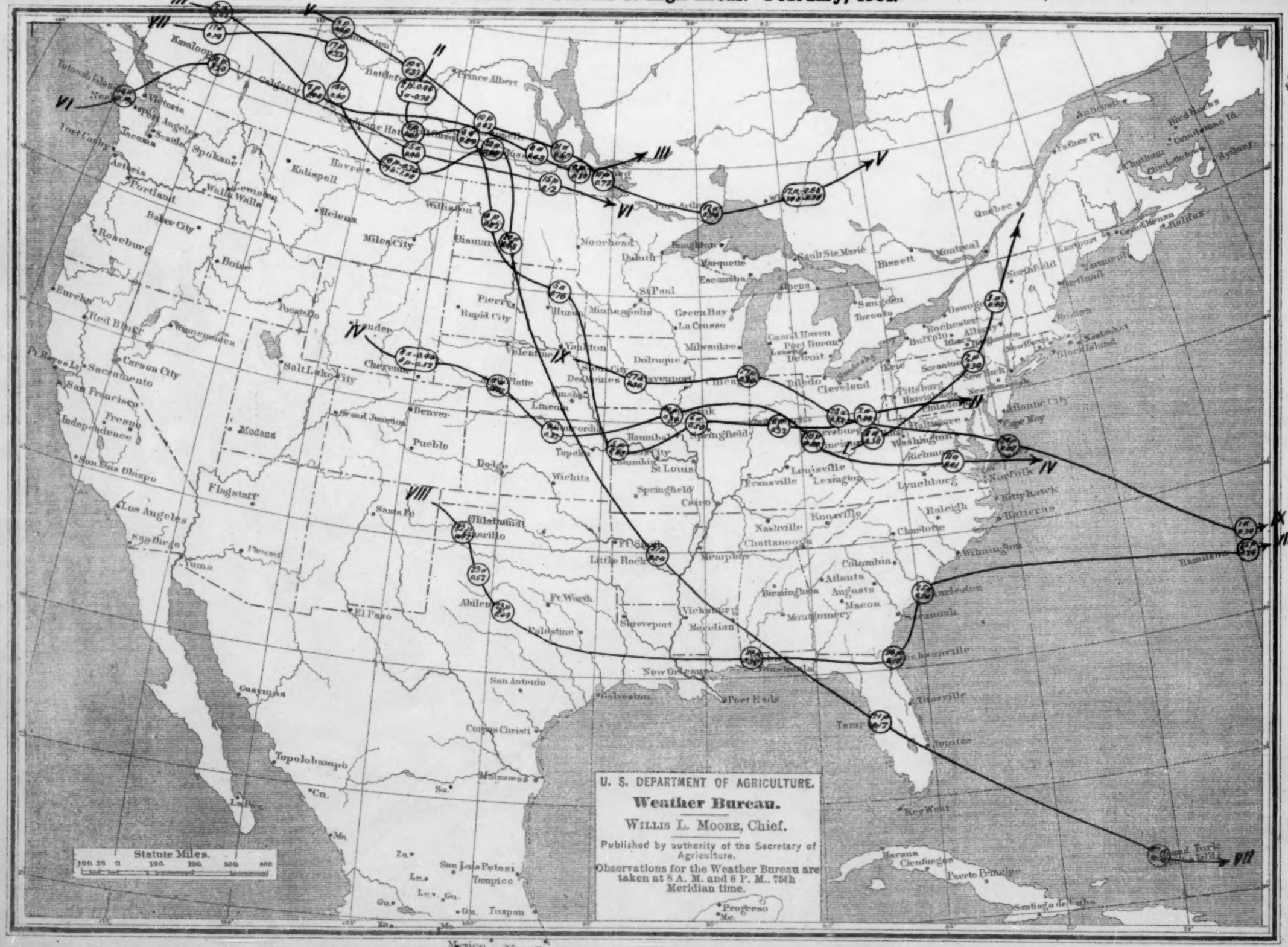
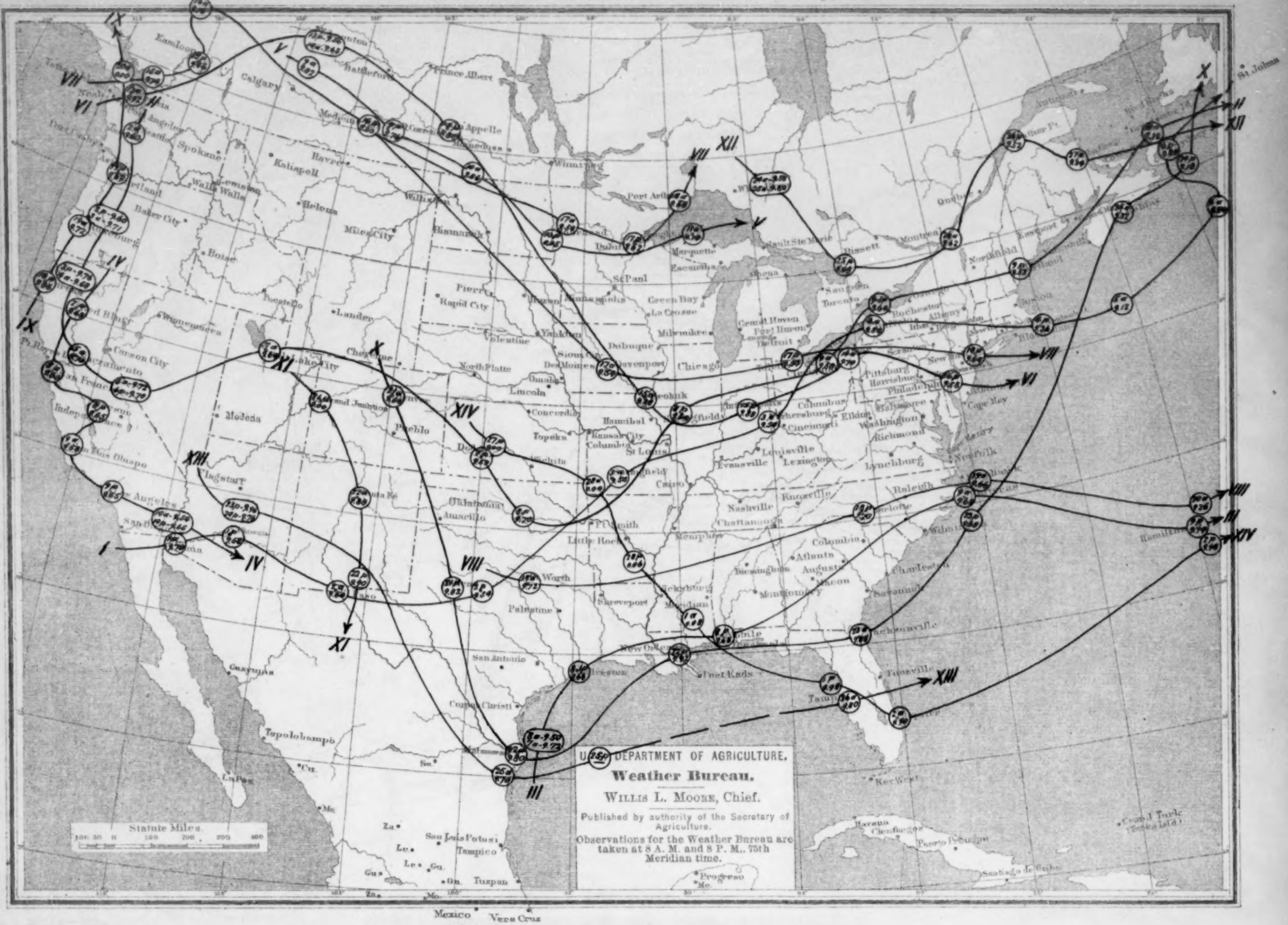


Chart II. Tracks of Centers of Low Areas. February, 1901.


Statute Miles
100 50 0 100 200 300 400
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Weather Bureau.
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Published by authority of the Secretary of Agriculture.
Observations for the Weather Bureau are taken at 8 A. M. and 8 P. M., 75th Meridian time.

Chart III. Total Precipitation. February, 1901.

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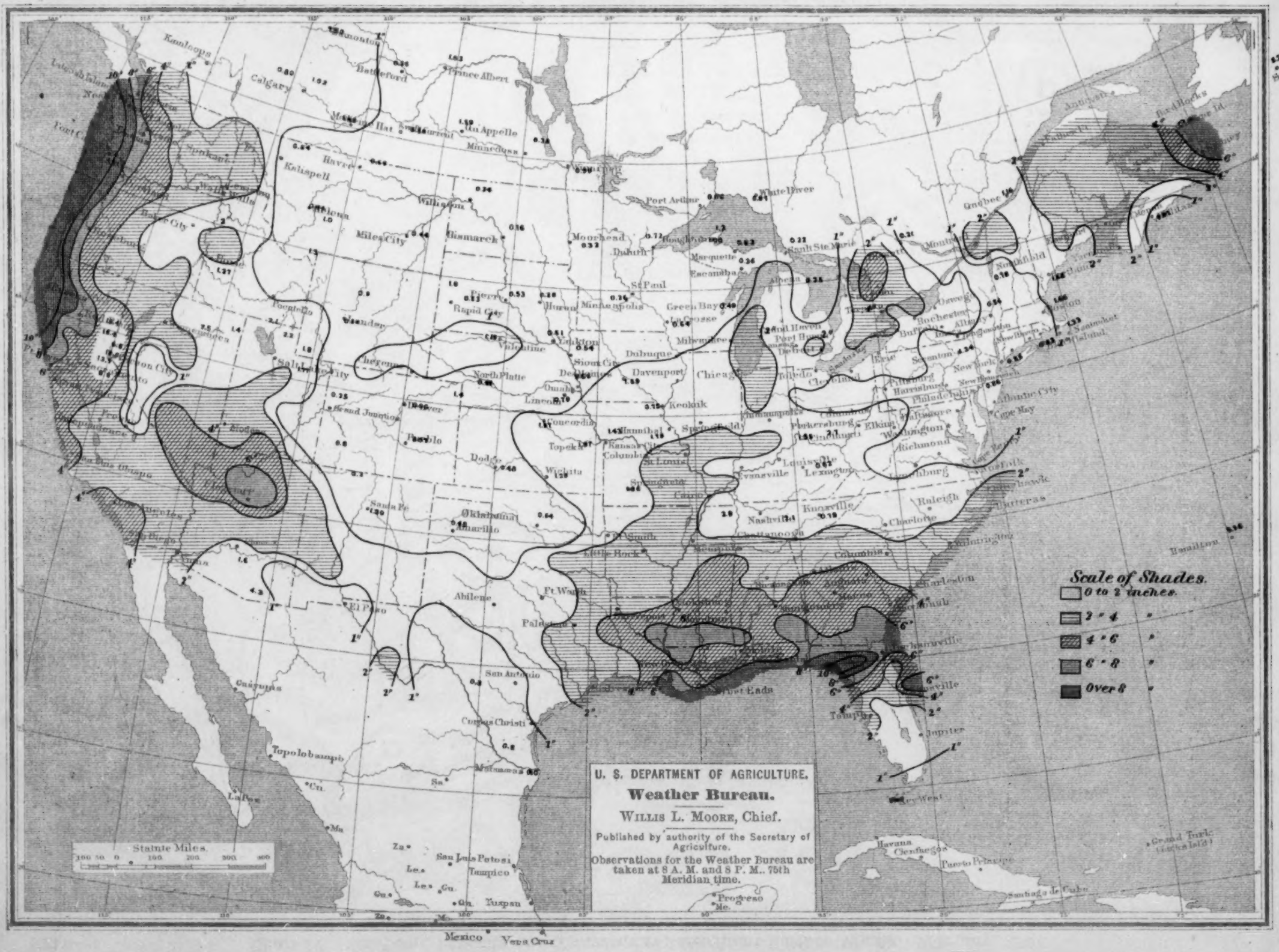
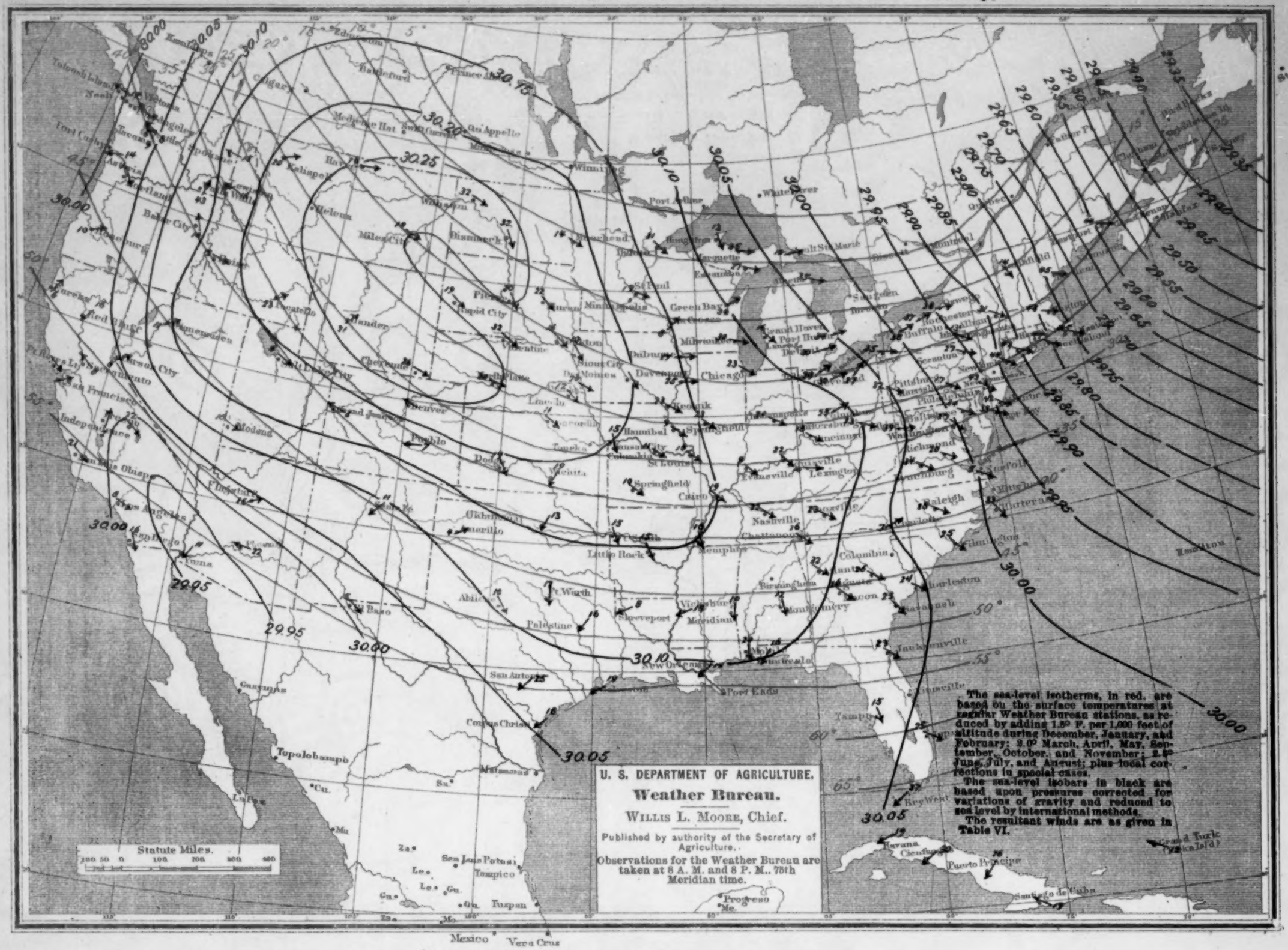


Chart IV. Sea-Level Pressure and Temperature; Resultant Surface Winds. February, 1901.


Statute Miles.
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The sea-level isotherms, in red, are based on the surface temperatures at regular Weather Bureau stations, as reduced by adding 1.5° F. per 1,000 feet of altitude during December, January, and February; 2.0° March, April, May, September, October, and November; 2.5° June, July, and August; plus local corrections in special cases.
The sea-level isobars in black are based upon pressures corrected for variations of gravity and reduced to sea level by international methods.
The resultant winds are as given in Table VI.

Chart V. Hydrographs for Seven Principal Rivers of the United States. February, 1901.

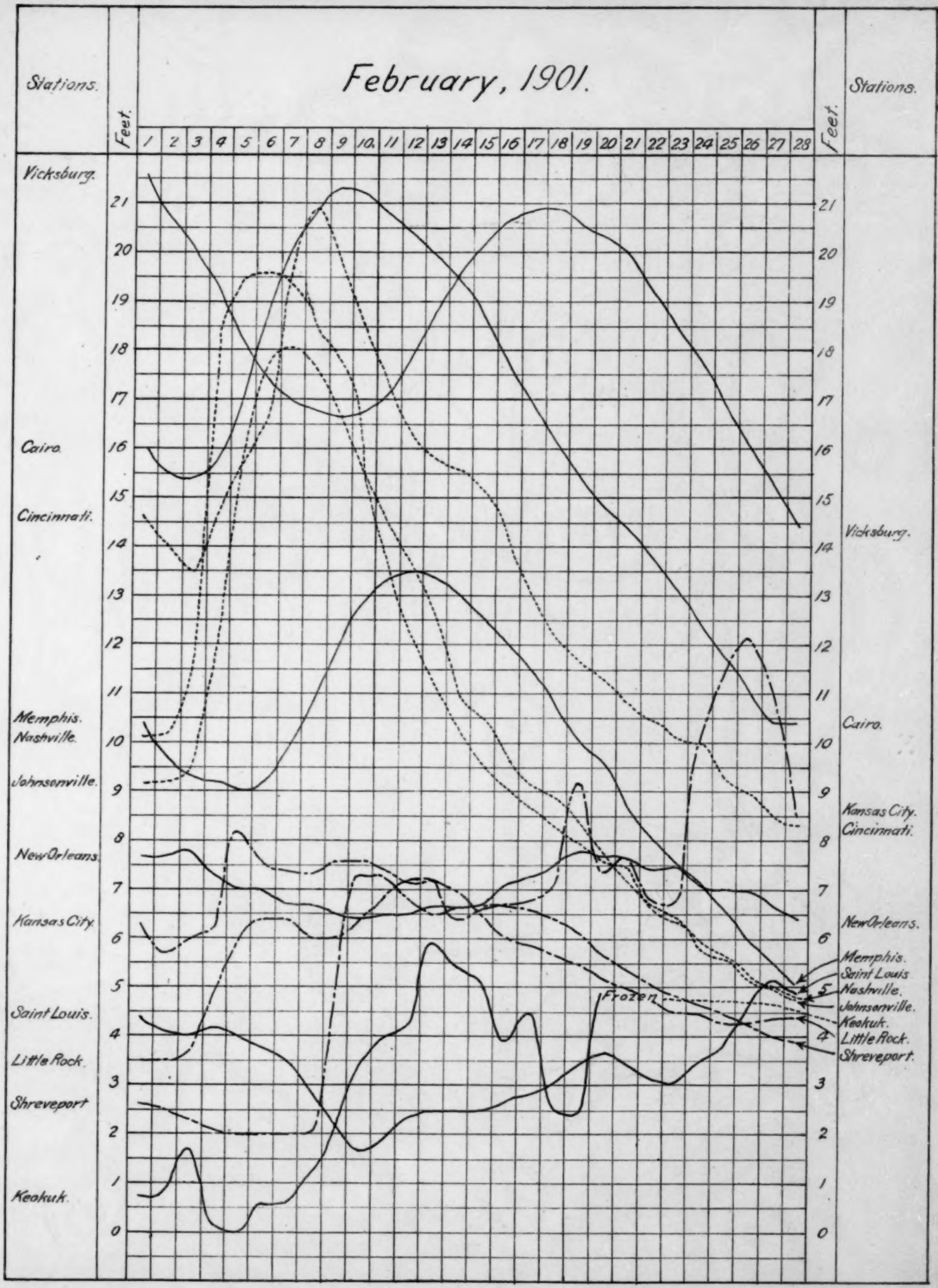
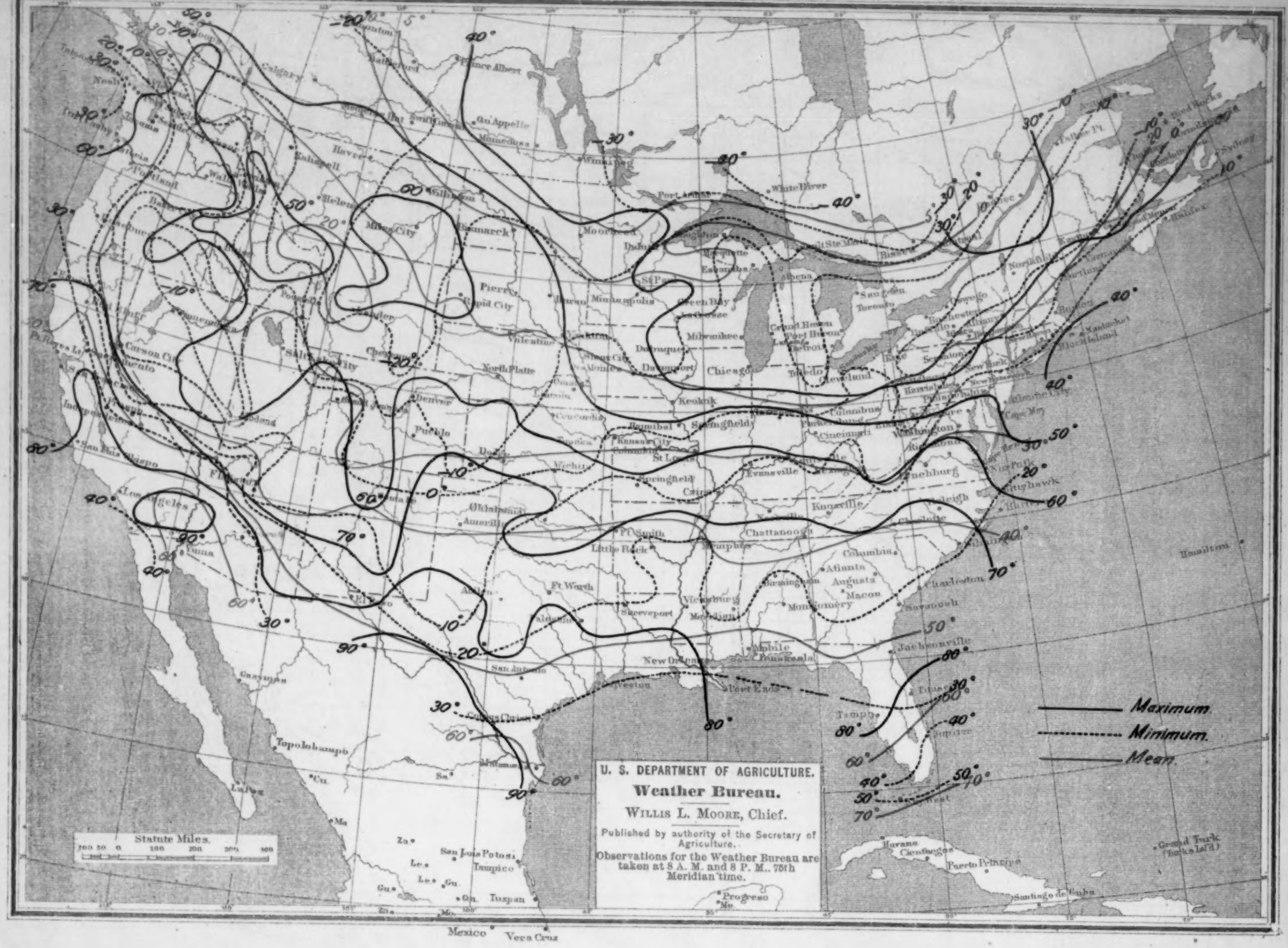


Chart VI. Surface Temperatures; Maximum, Minimum, and Mean. February, 1901.


Maximum.
Minimum.
Mean.
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Statute Miles.
Mexico
Vera Cruz

Chart VII. Percentage of Sunshine. February, 1901.

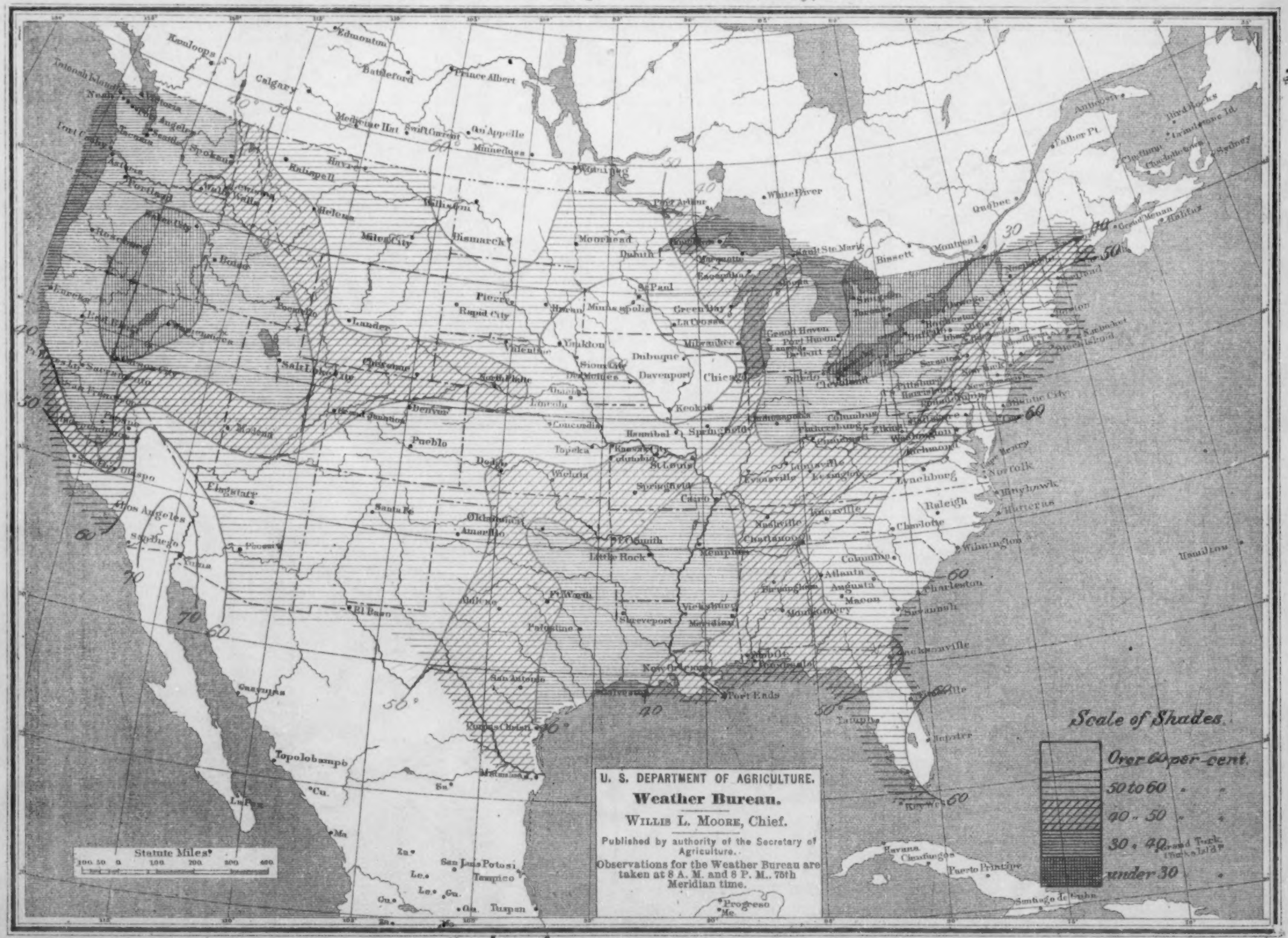


Chart VIII. West Indian Monthly Isobars, Isotherms, and Resultant Winds. February, 1901.

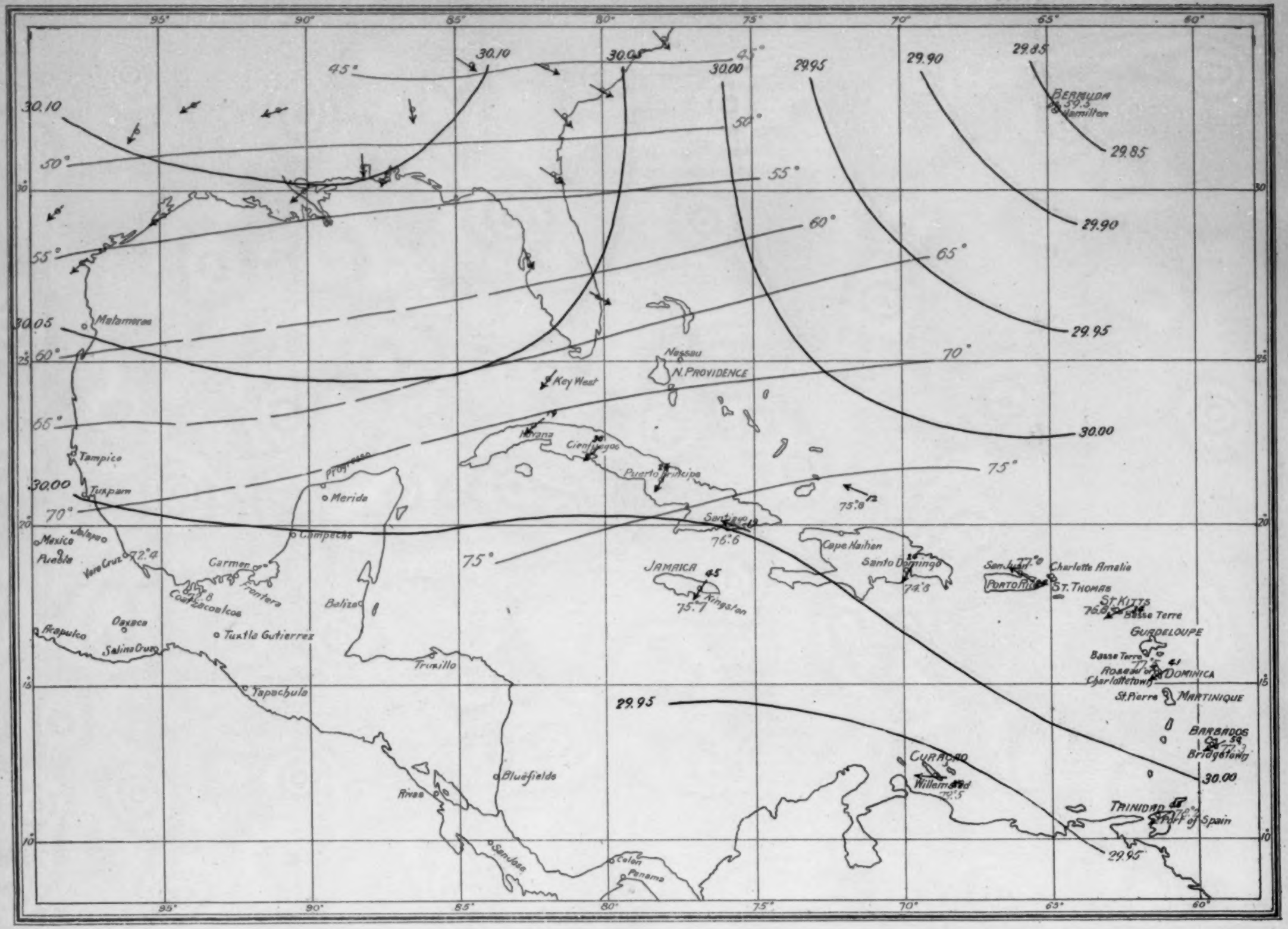
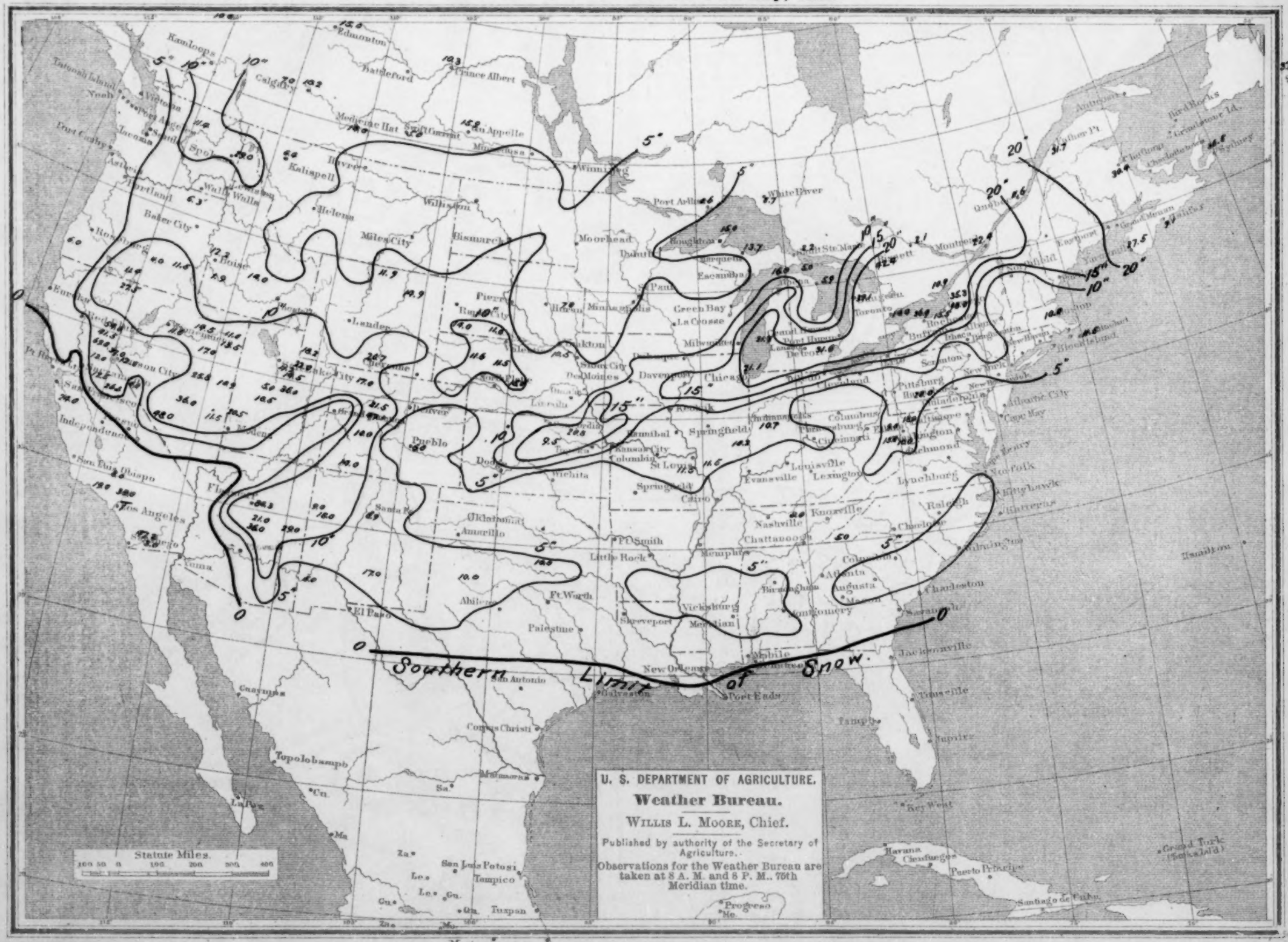


Chart IX. Total Snowfall for February, 1901.

Chart IX. Total Snowfall for February, 1901.


Southern Limit of Snow.
Statute Miles.
100 50 0 100 200 300 400
U. S. DEPARTMENT OF AGRICULTURE.
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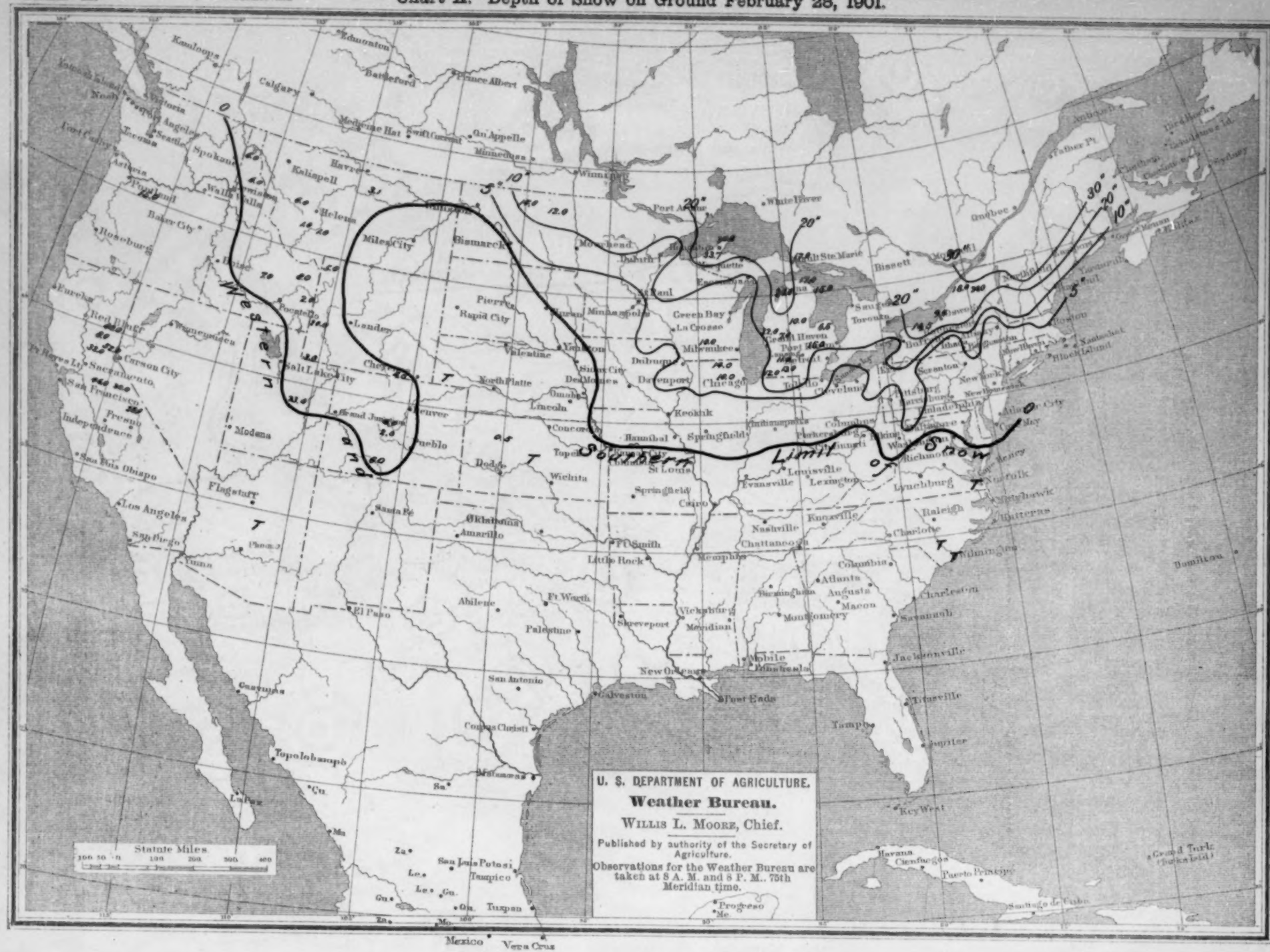
Barkerville
St. Johns
Mexico
Vera Cruz

• Baskerville

Chart X. Depth of Snow on Ground February 28, 1901.


Western Limit of Snow
Southern Limit of Snow
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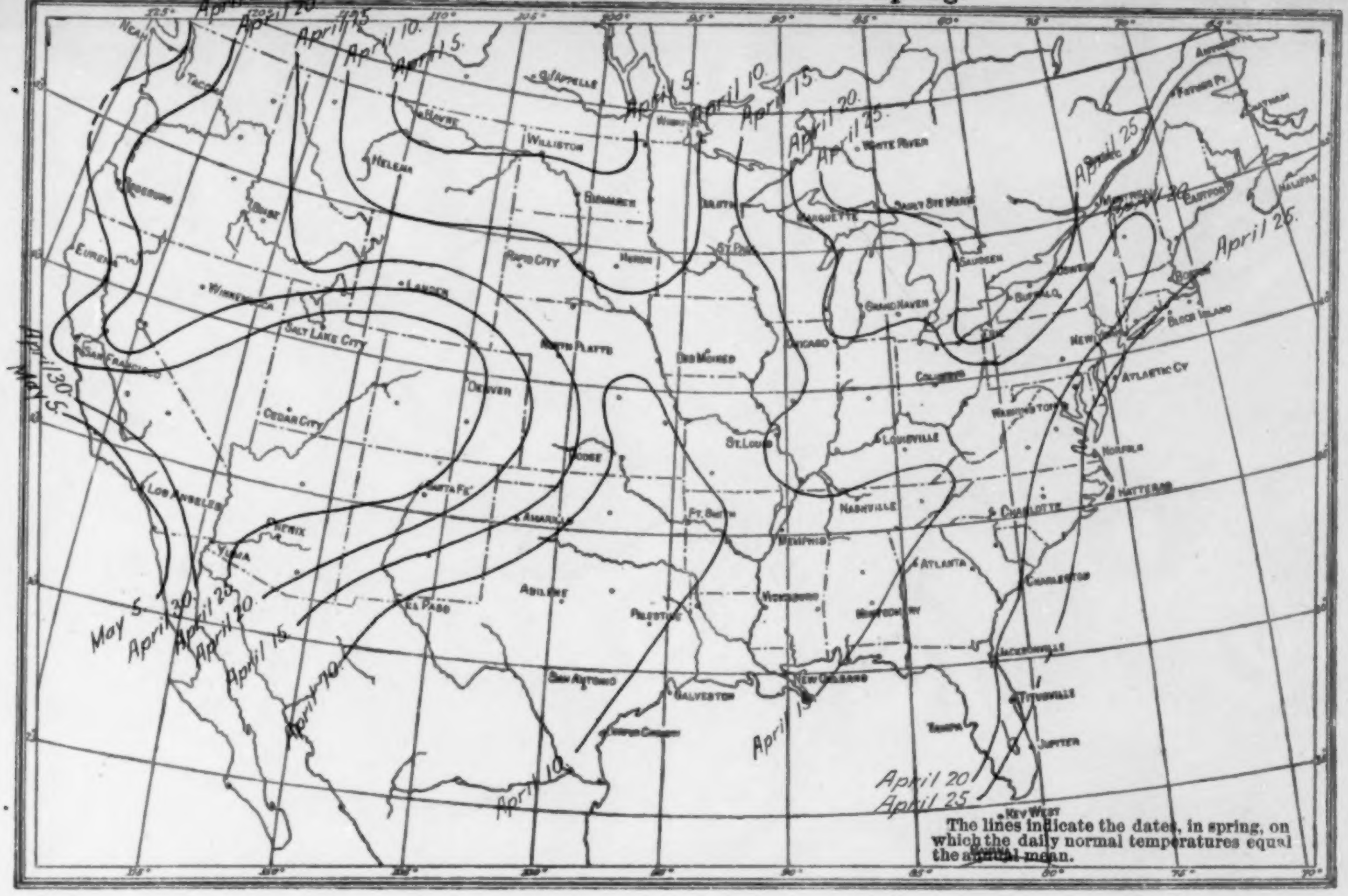
Statute Miles
100 50 0 100 200 300 400
Mexico
Vera Cruz

Chart XI. Isochronals for Spring.



The lines indicate the dates, in spring, on which the daily normal temperatures equal the annual mean.

Chart XII. Isochronals for Autumn.

The lines indicate the dates, in autumn, on which the daily normal temperatures equal the annual mean.

Chart XIII. Duration of the Warm Season.

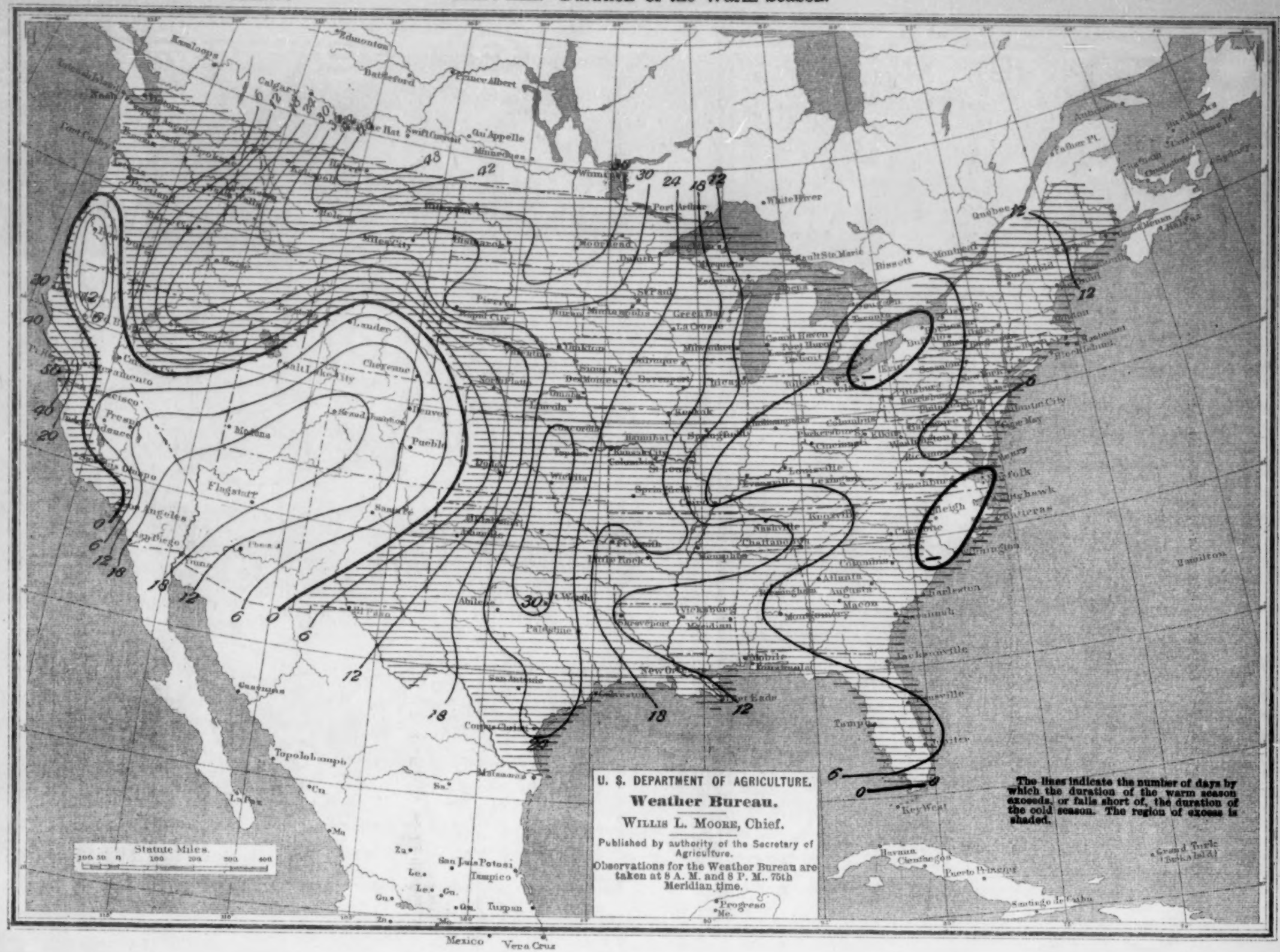

Statute Miles.
100 50 0 100 200 300 400
U. S. DEPARTMENT OF AGRICULTURE.
Weather Bureau.
WILLIS L. MOORE, Chief.
Published by authority of the Secretary of Agriculture.
Observations for the Weather Bureau are taken at 8 A. M. and 8 P. M., 75th Meridian time.
The lines indicate the number of days by which the duration of the warm season exceeds, or falls short of, the duration of the cold season. The region of excess is shaded.

FIG. 1.—Fog studies at Mount Tamalpais. Fog drifting from sea inland.

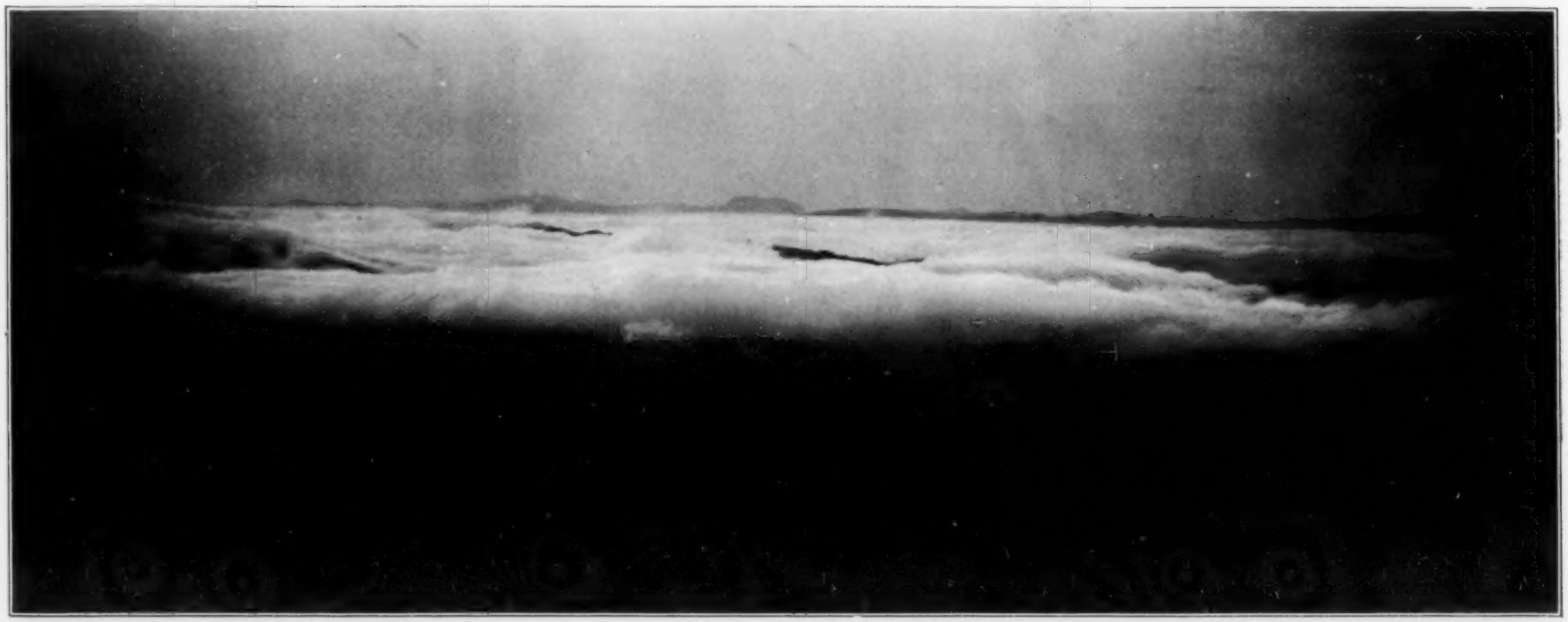


FIG. 2.—Fog studies at Mount Tamalpais. Fog stratum: clear above and cloudy below. Will dissipate in about three hours. Fog stratum as shown here is about 20 miles square. The elevation of the under surface is 1,000 feet; the thickness of the stratum is between 400 and 800 feet.

FIG. 3.—Wire baskets in citrus grove.

FIG. 4.—Wire baskets hung from limbs of orange trees.

FIG. 5.—Wire baskets in lemon and orange grove.

FIG. 6.—Mr. Priestly Hall's device for smudging.

FIG. 7.—Eight miners' inches of warm water in orange grove at Meacham Ranch.

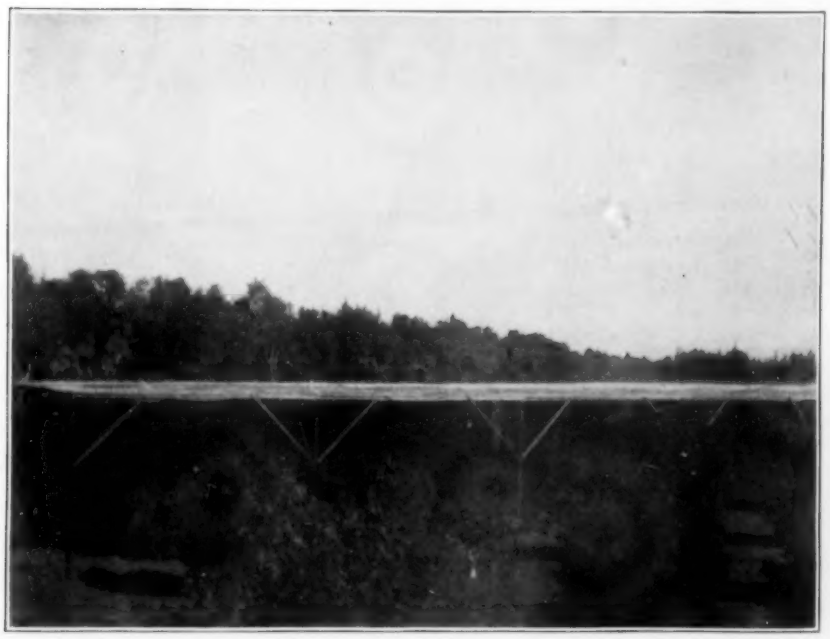


FIG. 8.—Lath screen at ranch of Mr. A. J. Everest, Riverside, Cal. (view from above).

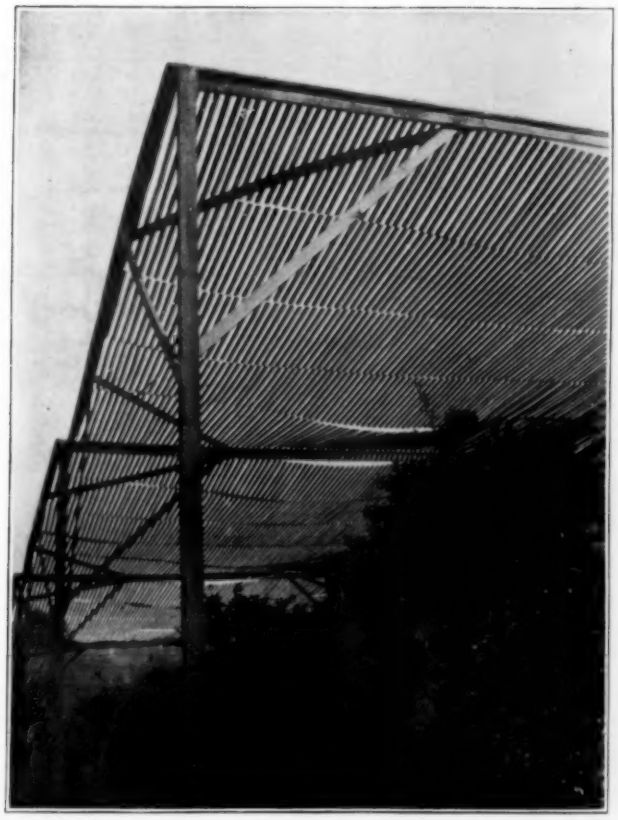


FIG. 9.—Lath screen at ranch of Mr. A. J. Everest, Riverside, Cal. (under view).